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THE WORLD RENOWNED

THE POPULAR ENCYCLOPEDIA

CONVERSATIONS LEXICON.

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THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

BEING

A GENERAL DICTIONARY OF ARTS, SCIENCES, LITERATURE, BIOGRAPHY, AND HISTORY.

NEW EDITION, WITH NUMEROUS ILLUSTRATIONS.

HALF-VOLUME V.

DRAMA—FRANCE.

LONDON:
BLACKIE & SON: PATERNOSTER BUILDINGS, E.C.;
GLASGOW AND EDINBURGH.
1874.

239.d.217.

GLASGOW:
W. G. BLACKIE AND CO., PRINTERS.
VILLAFIELD.

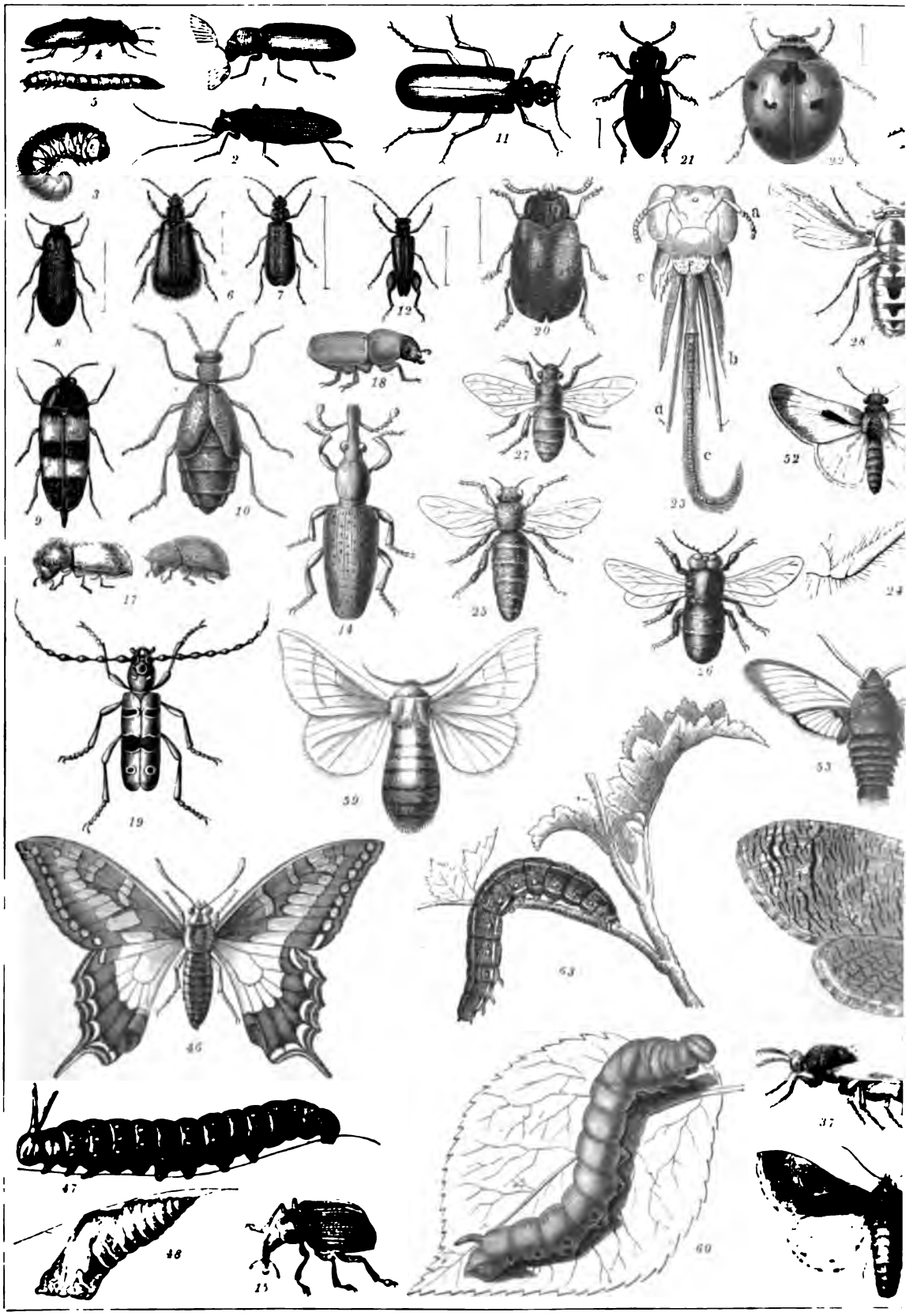
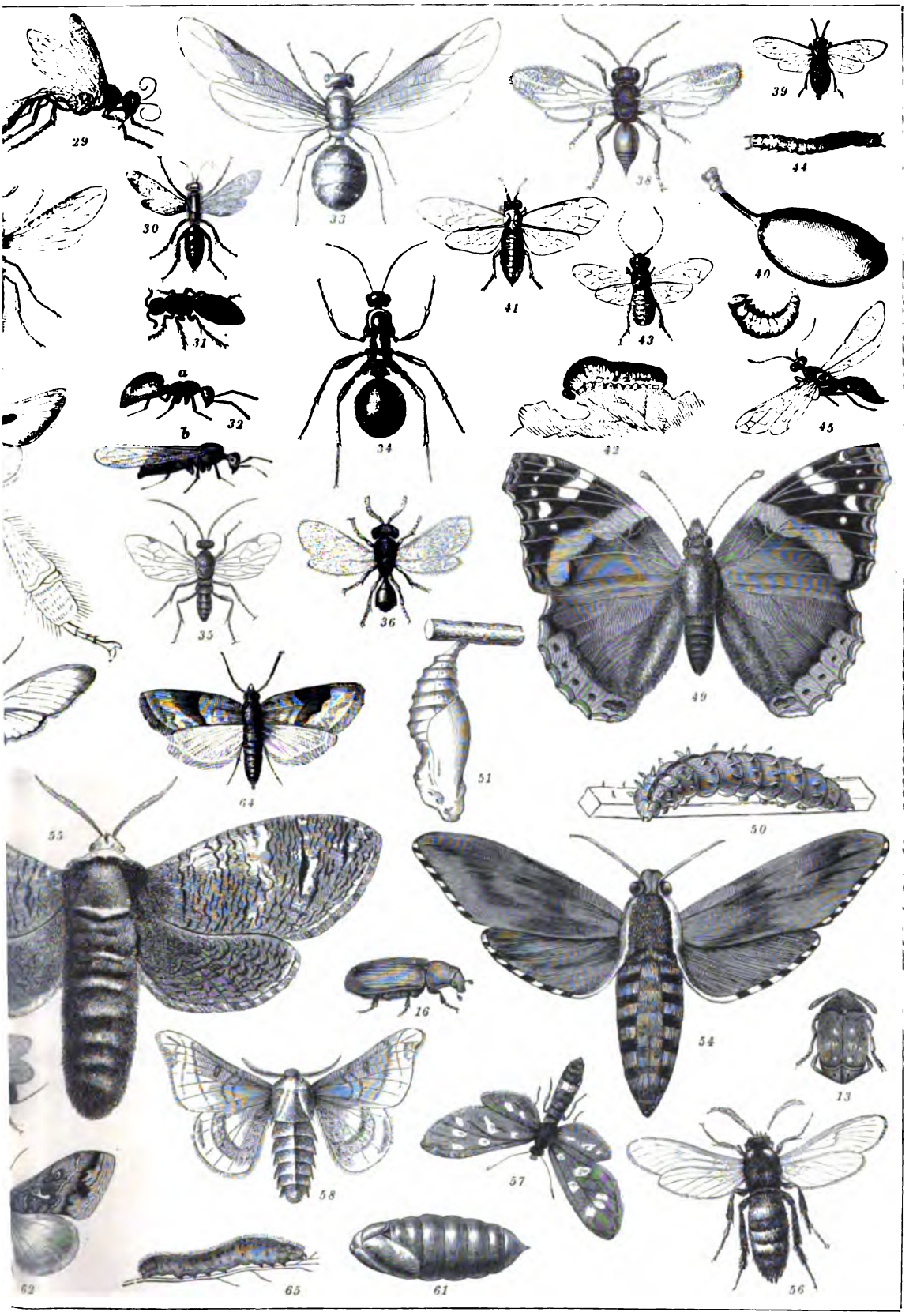


Fig 1 Bl[illegible] Beetle (*Pterostichus*) 2, 3 Boring-Beetle (*Prionus*) and Larva. 4–5 Tenebrio and Larva (mealworm). 6 Lucria. 7 Scarlet-Beetle. 8 Melandrya. 9 Merc[illegible] 10 Plum-tree Beetle. 19 Alpine Goat-beetle. 20 Lina Populi. 21 Fungus-Beetle. 22 Lady-bird. 23 Head of Bee. 24 Hindleg of Worker. 25–26, 27 Queen. D[illegible] of Brown Ant. 35 Microgaster. 36 Teleas. 37 Brilliant Ichneumon. 38 Rhodites Rosæ. 39, 40 Plum-tree Saw-fly and Larva. 41, 42 Turnip Saw-fly and [illegible] 52 Hesperia. 54 Hawk-Moth. 54 Pine Hawk-Moth. 55 Willow-Moth. 56 Bee-Moth. 57 Syntomis. 58, 59, 60, 61 Silkworm Moth—Male, Female, Caterpil[illegible]



sciata. 10 Meloe (Oil Beetle). 11 **Cantharis** (Spanish Fly). 12 Oedemera. 13 Pea-Beetle. 14 Corn-weevil. 15 Vine-Weevil. 16 Clover-Weevil. 17 Bostrychus.
e, and Worker. 28 Wasp. 29 Sand-Wasp. 30 Pompilus Viaticus. 31 European Mutilla. 32 *a*, Female Worker; *b*, Male of Yellow Ant. 33, 34 Female and Worker
larva. 43, 44 Pear-tree Fly and Larva. 45 Corn Saw-fly. 46, 47, 48 Swallow-tail Butterfly, Larva, and Pupa. 49, 50, 51 Admiral Butterfly, with Larva and Pupa.
and Chrysalis. 62 Ypsilon. 63 Caterpillar of Cabbage Butterfly. 64, 65 Vine-Roller and Caterpillar.

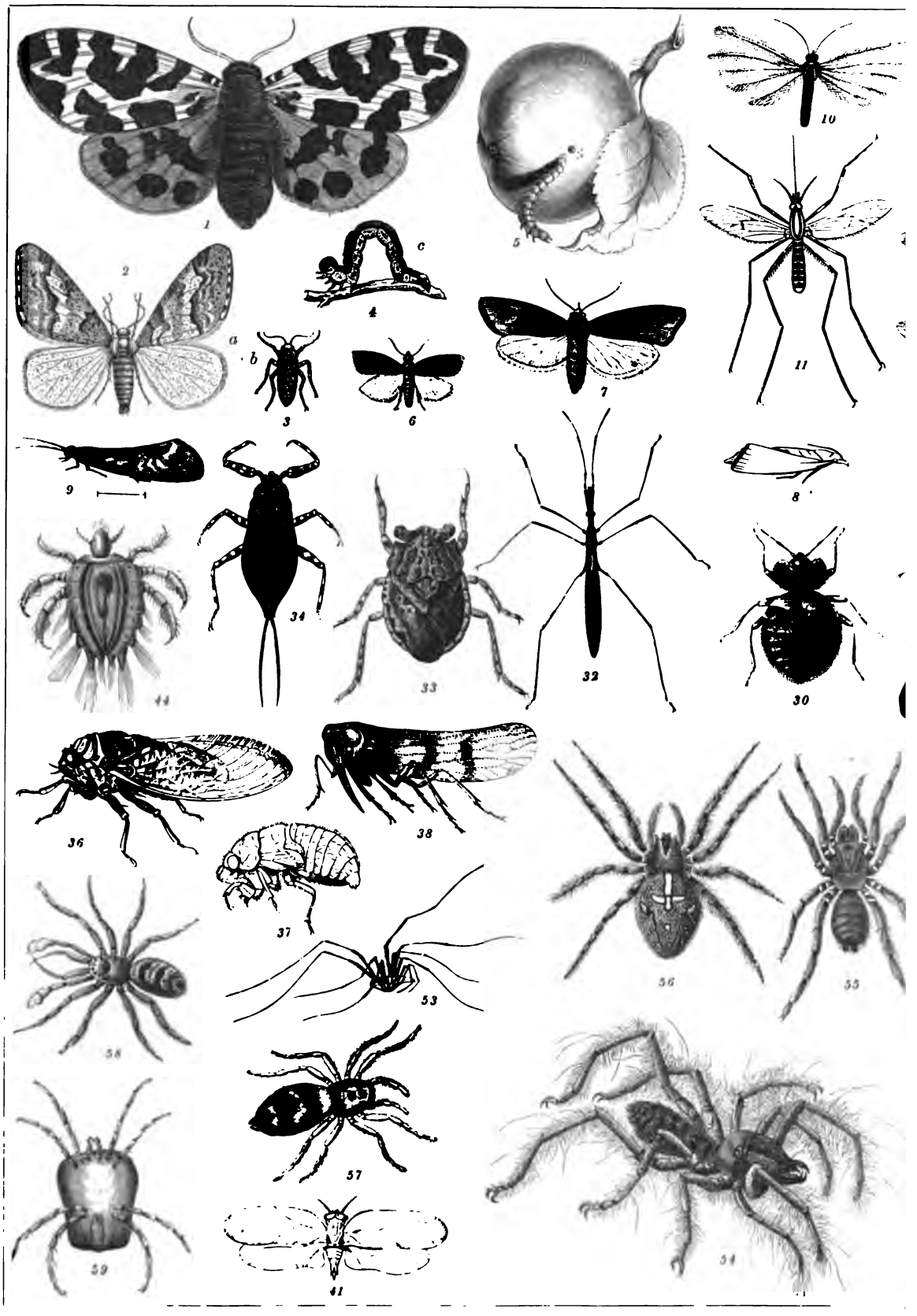
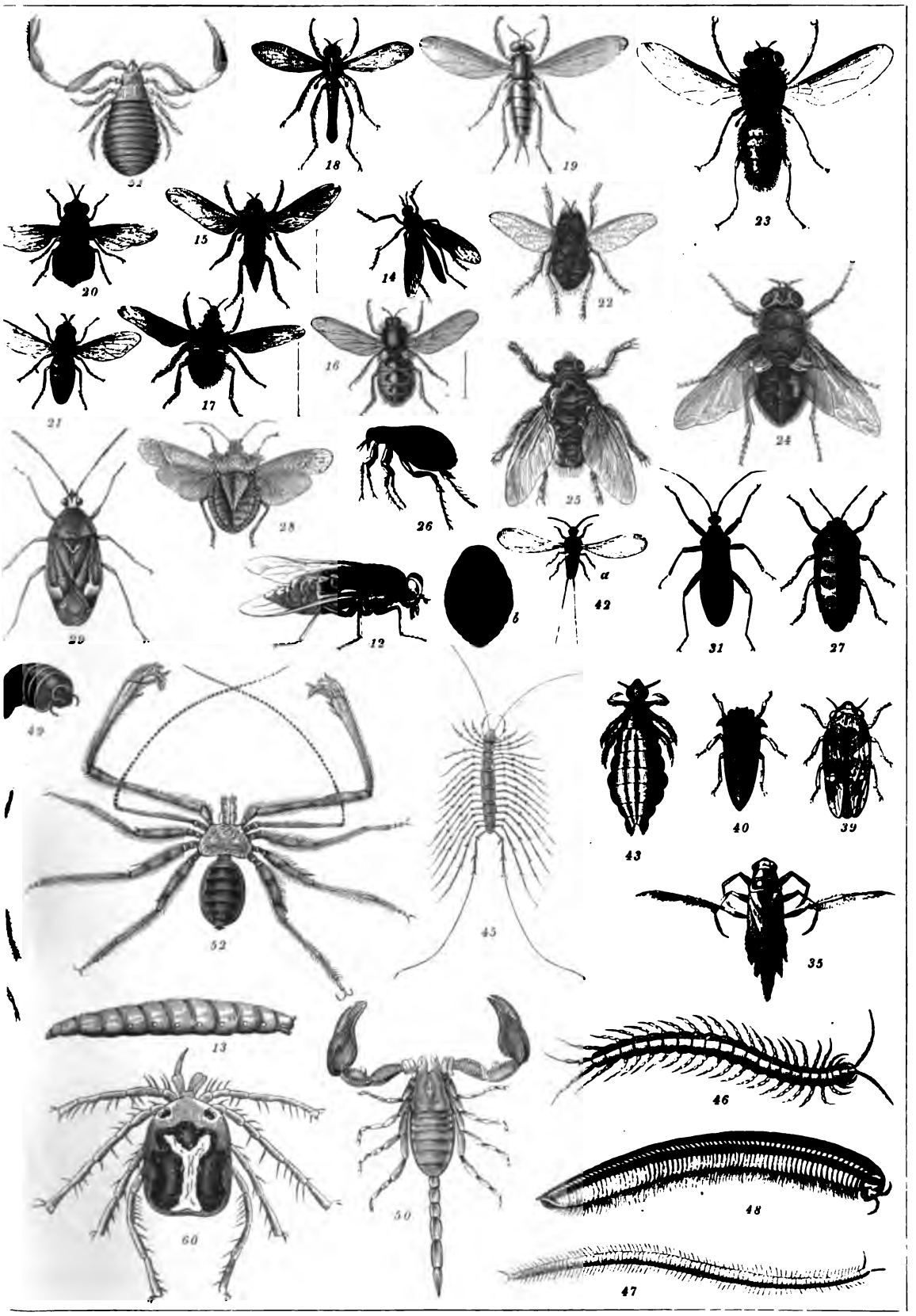


Fig. 1 Tiger Moth. 2,3,4 Winter-Moth—Male, Female, Caterpillar. 5,6 Apple-Roller. 7,8 Honey-Moth. 9 Clothes-Moth. 10 White-plume Moth. 11 Ringed Gnat. 22 Bot-Fly. 24 Blue-bottle. 25 Forest Fly. 26 Flea. 27 Beetle-Bug. 28 Wood-Bug. 29 Phytocoris. 30 Common Bug. 31 Reduvius. 32 Water-Flea. 33 Fly. 42 Cochineal, a, Male, b, Female. 43 Louse. 44 Crab-Louse. 45 Scutigera. 46 Scolopendra. 47 Millepede. 48 Centipede. 49 Pill-Worm. 50 Scorpion. 51 Bug.



12, 13 Breeze-Fly and Larva. 14 Hawk-Fly. 15 Leptis. 16 Anthrax. 17 Bombylius. 18 Vermileo. 19 Volucella. 20 Stratiomys. 21 Syrphus. 22 Tachina.
Scorpion. 24 Water-Scorpion. 25 Water-boatman. 26, 27 Cicada and Larva. 28 Burrowing Cicada. 30 Frog-hopper. 40 Centrotus Cornutus. 41 Psylla Genistæ.
Scorpion. 52 Tarantula. 53 Weaving-Spider. 54 Scorpion-Spider. 55 Mining-Spider. 56 Garden-Spider. 57, 58 Hunting-Spider. 59 Scarlet-Mite. 60 Water-Mite.

MONGOL.

1, Japanese. 2, Kalmuck woman. 3, Chinese, Mandarin. 4, Esquimaux. 5, Thibetan. 6, Samoied. 7, Hungarian, Magyar. 8, Norwegian Lapp. 9, Turk of Roumelia.

MALAY.

1

2

3

4

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9

1. Native of New Guinea. 2. Marquesas Islander. 3. Loondoo Dyak. 4. Carib. 5. an Assineboin.
6. Guyani Woman, Civilised. 7. New Zealand Chief. 8. Cambo an Aboriginal Australian. 9. Patagonian Woman.

MONGOL.

1. JAPANESE. 2. KALMUCK WOMAN. 3. CHINESE MANDARIN. 4. ESQUIMAUX. 5. THIBETAN. 6. SAMOIED.
7. HUNGARIAN MAGYAR. 8. NORWEGIAN LAPP. 9. TURK OF ROUMELIA.

MALAY.

1. Native of New Guinea. 2. Marquesas Islander. 3. Loondoo Dyak. 4. Carib. 5. an Assineboin. 6. Guyani Woman—Civilised. 7. New Zealand Chief. 8. Cambo an Aboriginal Australian. 9. Patagonian Woman.

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ETHIOPIAN.

1

2

3

4

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7

8

9

1. Coptic Monk. 2. Nubian. 3. Galla Woman. 4. Mandingo Trader. 5. Bambara Man in War Costume.
6. Ashantee Officer. 7. Bushwoman. 8. Kaffir of Natal. 9. Yoloff of Walo in War Dress.

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CAUCASIAN.

1

2

3

4

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9

Drawn by J L Williams

Engraved by T Brown

1. Georgian. 2. Jew of Mordok. 3. Persian 4. Sonthal one of the Native Races of India. 5. Mahratta of the Deccan. 6. Greek officer of Nauplia. 7. Russian. 8. Pomeranian. 9. Spaniard.

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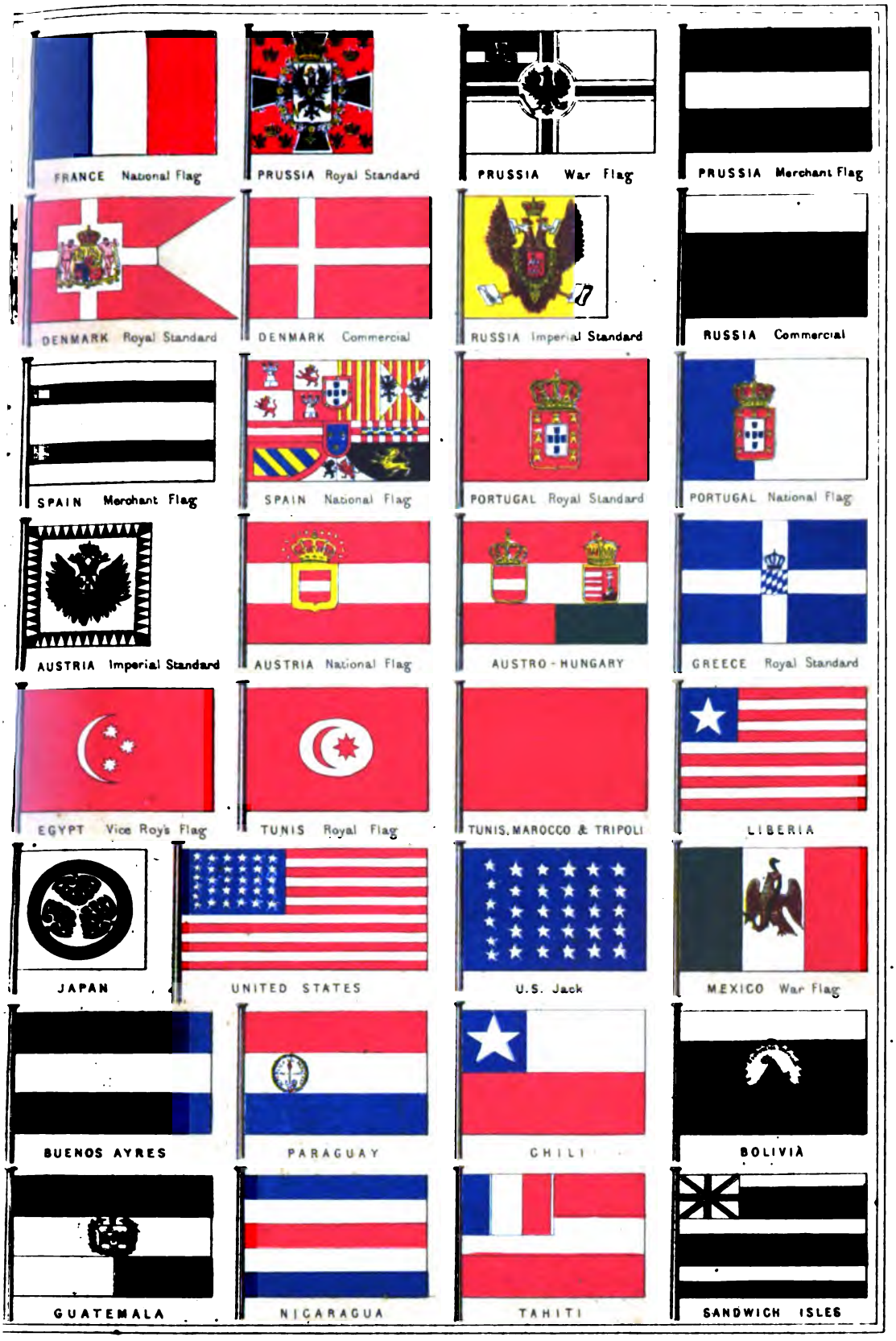
ETRUSCAN VASES

Engd by R. Scott Edinr.

Published by Blackie & Son, Glasgow



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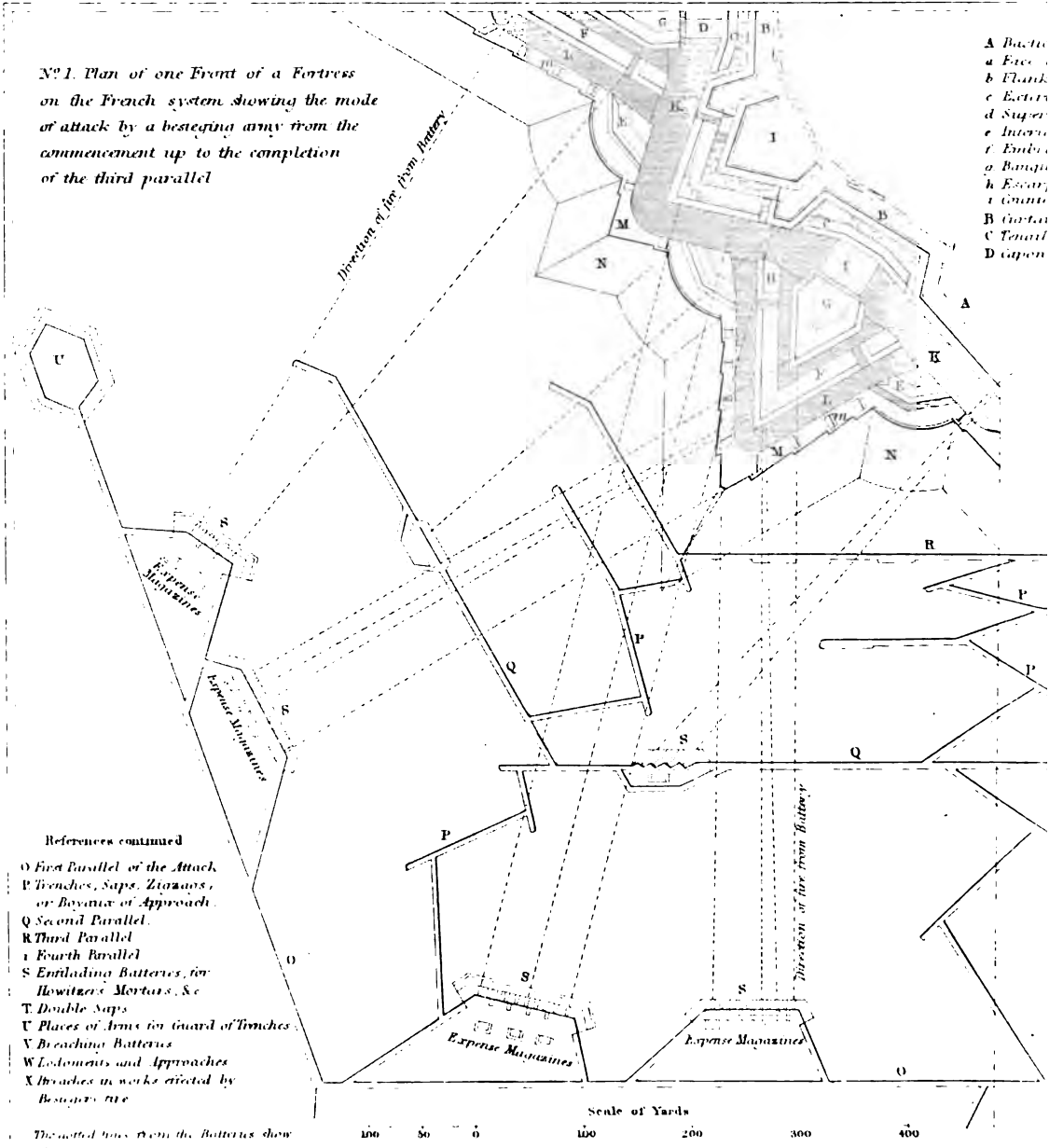
№ 1. Plan of one Front of a Fortress on the French system showing the mode of attack by a besieging army from the commencement up to the completion of the third parallel



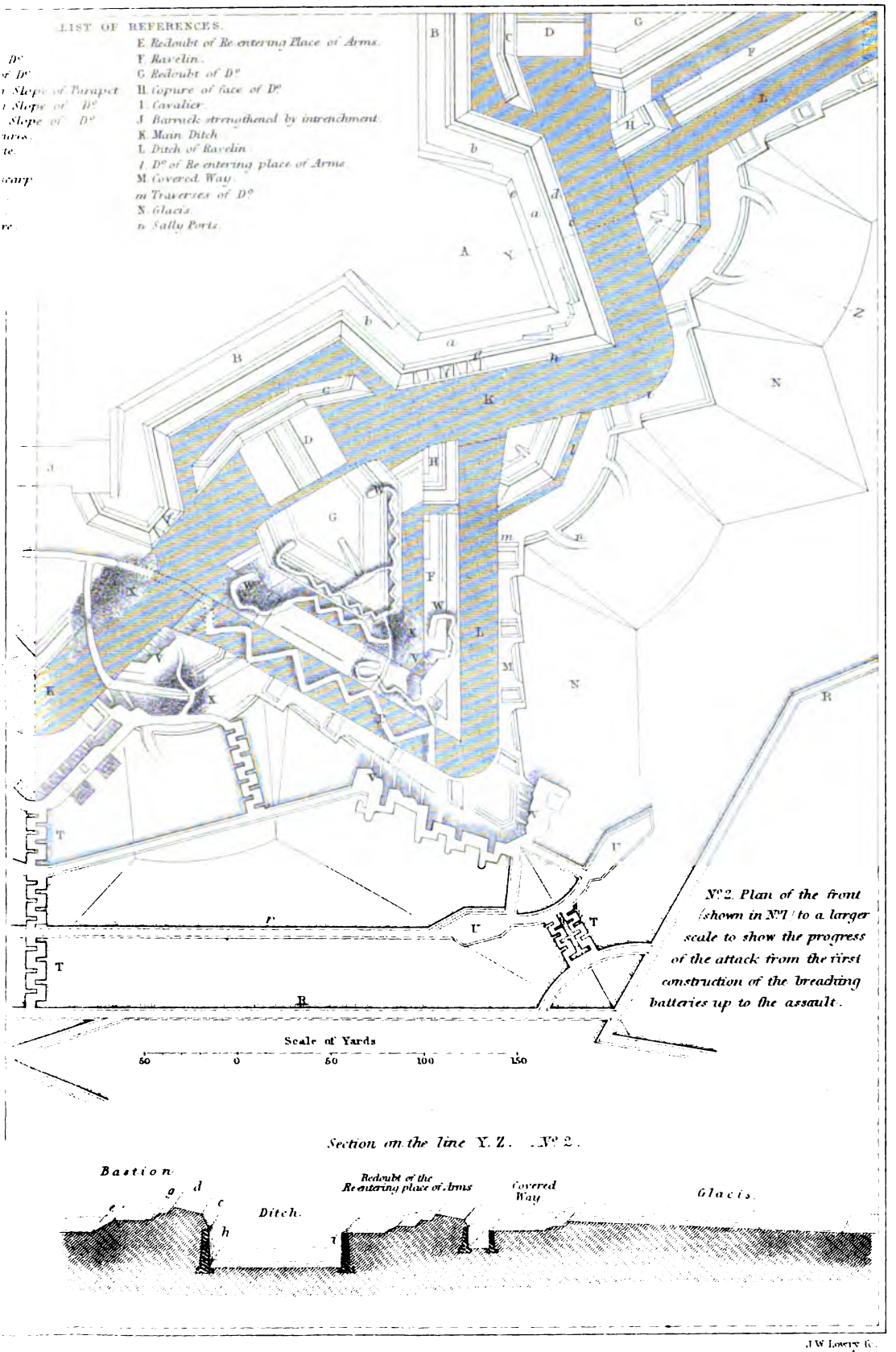
References continued

O First Parallel or the Attack.
P Trenches, Saps, Zigzags, or Boyaux of Approach.
Q Second Parallel.
R Third Parallel
s Fourth Parallel
S Enfilading Batteries, for Howitzers Mortars, &c
T Double Saps
U Places of Arms or Guard of Trenches
V Breaching Batteries
W Lodgments and Approaches
X Breaches in works effected by Besieging fire

The dotted lines from the Batteries show the direction of fire from the guns

Sap or Trench in course of construction

PLANCHE X


LIST OF REFERENCES.
E. Redoubt of Re entering Place of Arms.
F. Ravelin.
G. Redoubt of Dº
H. Copure of face of Dº
I. Cavalier.
J. Barrack strengthened by intrenchment.
K. Main Ditch
L. Ditch of Ravelin
l. Dº of Re entering place of Arms
M. Covered Way
m Traverses of Dº
N. Glacis.
n. Sally Ports
Nº 2. Plan of the front shown in Nº 1 to a larger scale to show the progress of the attack from the first construction of the breaching batteries up to the assault.
Scale of Yards
50 0 50 100 150
Section on the line Y. Z. Nº 2.
Bastion
Ditch.
Redoubt of the Re entering place of Arms
Covered Way
Glacis.

J.W. Lowry fc.

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EUROPE
BY J. BARTHOLOMEW, F.R.G.S.
British Miles
Kilometres
ARCTIC OCEAN
ATLANTIC OCEAN
MEDITERRANEAN
Iceland
Faroe Is.
Shetland Is.
Orkney Is.
Hebrides
BRITISH ISLES
SCOTLAND
IRELAND
NORTH SEA
BALTIC SEA
Gulf of Bothnia
NORWAY
SWEDEN
DENMARK
GERMANY
Poland
FRANCE
SPAIN
PORTUGAL
BAY OF BISCAY
English Channel
AUSTRO-HUNGARY
Bohemia
SWITZERLAND
ITALY
Sardinia
Corsica
Majorca
Balearic Isles
Adriatic Sea
TURKEY
GREECE
Servia
Malta
Sicily
Palermo
Naples
Tripoli
Barca
MOROCCO
ALGERIA
Tunis
Algiers
Fez
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Str. of Gibraltar
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Rostoff
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Sofia
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Rustchuk
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Bucharest
Jassy
Galatz
Kischeneff
Odessa
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Str. of Gibraltar
Arctic Circle
Lofoden Is.
Malstrom
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Gallipoli
Adrianople
Philippopolis
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Widin
Rustchuk
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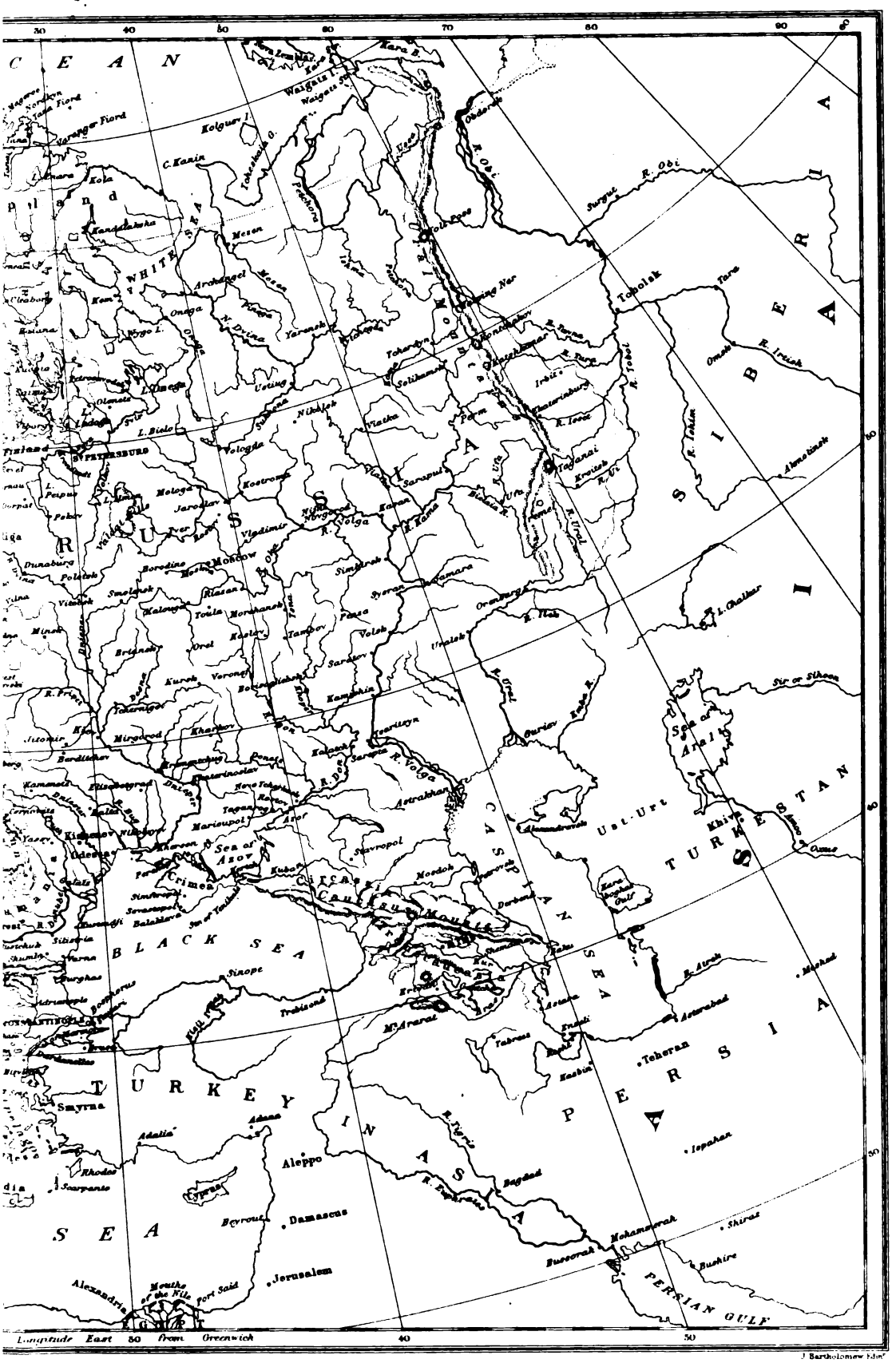

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THE

POPULAR ENCYCLOPEDIA;

OR,

CONVERSATIONS LEXICON.

DRAMA (the Greek *drama*, from *draō*, I act), a class of writings in which the author does not appear as such, either reasoning or relating, but persons are represented as acting and speaking, and the course of the story and the feelings of the parties are to be gathered from what they say. In epic poetry the persons of the poem are also often introduced speaking, but description is the prevailing characteristic of the epopee, whilst in the drama everything is represented as actually happening. The drama, therefore, represents *action* and its motives directly, not in the way of description. Taking the word in its most general sense, we also call an epic poem or a novel *dramatic* when a quick succession of interesting events is rapidly developed; when, in a word, action prevails over description or reasoning. The French, however, designate by *drame* only something intermediate between tragedy and comedy.

The origin of the drama must be sought for in that powerful agent in human nature—the love of imitation. The rude war-dance of a savage tribe is a beginning of the drama, because it represents an action for the entertainment of the spectators or performers, and the dance is found among all early religious rites. (See DANCING.) So dramatic performances, that is to say, imitative representations of important events in religious history, are found among the rites or religious services of all nations in their early period. With many they are always preserved, as the Catholics, both Greek and Roman, to this day, at the celebration of their various festivals, bring forward exhibitions which represent, with more or less accuracy, the chief particulars of that event which is to be commemorated.

The elements of the dramatic art, as has already been said, are found among all nations; and every people which has made progress in civilization has, at the same time, developed this art. The Chinese and the Indians have their dramatic performances; but the Europeans are indebted for the drama, as for many other productions of civilization, to the Greeks. From them it passed to the Romans, whose acquisitions in civilization were in part preserved and in part revived by the Italians, though the latter never cultivated this species of poetry, at least the tragic branch of it, so much as the epic and the lyric. The gifted Machiavelli, inspired by the productions of the ancients, may be said to have commenced a new era of the drama, though the art had been in some measure cultivated by the Italians before his time. But the dramatic genius who has surpassed all ancient and modern writers, in universality of conception and knowledge of human nature, appeared among the English.

No art, useful or ornamental, is in its origin clearly defined. The dramatic art, in its origin among the Greeks, was by no means so distinctly separated from epic and lyric poetry as we find it at a later period. The Greek comedy commenced about 520 B.C. with Susarion, the contemporary of Thespis, who travelled from place to place holding up to ridicule, on a small movable stage, the follies and vices of his age. The old comedy of the Greeks consisted of dramatic-epic songs connected with dancing, by which travelling actors entertained the people; and the name *comedy* is by many derived from *kōmē*, a village, so that its original meaning would be *village-song*, though others derive it from *kōmos*, a revel. The contents of these songs were mirthful, ludicrous, often indecent. By degrees tragedy became a distinct branch of the art, and its graver scenes served as an entertainment for the inhabitants of the cities, whilst the comedy retained its gay character, and chiefly served to amuse the country people of Attica. Regular companies of comedians were at length established at Athens, where they were only tolerated by the government. A chief, a dancing and singing chorus, together with several actors, appeared on a convenient stage. Epicharmus, about 485 B.C., introduced unity of action, and modelled his comedies after the tragedies. His comedies were popular in Greece, and among his followers are distinguished Phormes, Magnes, Crates, Cratinus, Eupolis, Pherecrates, and Aristophanes. With all these personal satire was the chief object, and magistrates, as well as private persons, were called by name and exhibited on the stage. The old comedy of the Greeks was thoroughly national, with somewhat of a political tendency. It was in vain prohibited by laws and decrees of the people.

At the end of the Peloponnesian war comedy received a new character and form. The *middle comedy*, so called, now began. The new oligarchy deprived the people of the privilege of ridiculing the measures of government. It was strictly prohibited to bring living persons by name on the stage, and the chorus, till then the chief instrument of vituperation, was abolished; whilst, with the representations of general characters, corresponding masks were introduced, instead of those imitating the countenances of particular individuals. Even Aristophanes was obliged to submit to these regulations in his last productions, and thus comparative decorum was introduced into the representations. The subjects of comedy continued to be taken from mythology and history; but the descriptions of the ridiculous were more general than formerly, when they were often entirely individual. The chorus rarely appeared. To the *new comedy* of the Greeks belongs Menander, about 300 B.C., who, by the keenness of his wit, and the regularity of his pieces, began a new period of the Greek

comedy. Of him and Philemon fragments only have come down to us. For a particular account of the character of the Greek comedy, as distinguished from the tragedy, we refer the reader to the excellent Lectures on Dramatic Literature, by A. W. Schlegel.

Tragedy consisted originally of lyric and epic songs sung in honour of Bacchus, at the festival of the vintage. The traces of its origin are lost. (See GREECE—Literature.) The invention of tragedy is generally ascribed to Thespis, who was followed by Phrynichus. The true creator of the tragedy was Æschylus; Thespis had only one actor, who from time to time relieved the chorus by declamation. Æschylus changed this representation into real action by making use of two, sometimes three or four actors, and inventing the dialogue. Being assisted by the liberality of the government, he increased the number of his actors, who now became the principal object of interest with the spectators: the chorus, on the other hand, became less prominent; its songs were shortened, though they still remained very long, and were always written in a tone of the highest lyrical elevation, which sometimes appears even in the dialogue. Æschylus aimed more at sublimity than beauty. There are many traces of rudeness in his plays, yet they are wonderfully grand. The action is simple in the extreme. The chorus no longer chants songs which have no connection with the play, but it forms a part of one whole, is the adviser of kings, the confidant of the persons of the action, the comforter of the unhappy, the terror of tyrants. Instead of wine lees, with which the actors of Thespis had besmeared their faces, Æschylus introduced masks; and by means of a long gown and the *cothurnus*, or buskin, the lofty stature of the heroes was imitated. The accommodations for the spectators were improved, and machinery and scenery were introduced. The theatres, which had been formerly built of wood, were now large stone erections, capable of containing the greater number of the citizens. They were unroofed, and the performance took place during the daytime. Æschylus generally instructed his actors himself in the declamation of his pieces. Sophocles followed him, and showed himself a master of the tragic art: he knew better than his predecessor how to excite compassion and to move the human heart. Euripides was superior to both in this respect, but he is not happy in the plan and execution of his plays. These three great poets carried the Greek tragedy to its perfection. Many poets followed them, but only the three just named have left works which have come down to us.

The Romans, a practical nation, and not possessing that keen sense of beauty which we find in ancient Greece, never accomplished much in this branch. The earliest specimens of the drama in Italy were the Fabulæ Atellanæ, so called from Atella, a city of the Oscians, whence the performers in these entertainments came to Rome. Plautus and Terence were imitators of the new Greek comedy. Of the Roman tragedy, the dramas which go under the name of Seneca are the only specimens extant. (See SENECA and ENNIUS.) When the enormous accumulation of wealth in Rome, and the total depravity of morals, had corrupted almost everything which ancient Rome and Greece had produced, the theatre became little better than a show place, where spectacles were exhibited rather than plays performed.

In the beginning of the middle ages, when everything noble was buried under the deluge of barbarism, the dramatic art was lost, or existed only among the lowest classes of the people in plays improvised at certain festivals, for instance the carnival. These were attacked as heathenish, immoral, and indecent exhibitions; but the favour which they enjoyed among the people, and the spirit of the times, induced the clergy to encourage theatrical exhibitions of subjects from sacred history. These were called *mysteries* (which see), and in all the southern countries of Europe, as well as in Germany and England, preceded the rise of the national drama. Of this kind were the ridiculous Festa Asinaria, in which mass was read by persons dressed like asses, and every means taken to divert the people in churches, on the occurrence of the festival of Easter. So popular were these extravagances that even the decrees of popes against them were for a long time of little avail.

With Albertino Mussati (born 1260) a better kind of drama arose. He wrote some tragedies, and the drama in Italy was divided into the *erudita* and the *commedia dell'arte*, which last is supposed to be derived from the ancient *Fabulæ Atellanæ* and the *mimi*. Cardinal Bibbiena wrote the first genuine Italian comedy—the Calandria—an account of which would startle the reader, who should be told that it was performed for the amusement of the holy fathers of the church, and the principal clergy, in the presence of the ladies of the court. Ariosto and Machiavelli wrote dramas; and of the Mandragola of the latter, Voltaire says that it is worth all the comedies of Aristophanes; which shows, at least, that it is a valuable performance. The comedy was cultivated by many Italians, including numerous ecclesiastics. Leo. X. was a great patron of the theatre. Alfieri is the most important of the dramatic writers of Italy; yet his comedies are to be considered rather as bitter satires. His comedies are more tragic than his tragedies. Goldoni is considered the best Italian writer of comedy.

The other European nations cultivated the dramatic art much later than the Italians. The English and Spaniards devoted their attention to it almost at the same time; the former reaching their acme in Shakspeare, the latter in Lope de Vega or Calderon. The history of the English theatre and the drama is naturally divided into two parts, the first of which begins with Elizabeth, and ends with the reign of Charles I. The Puritans then prohibited all kinds of plays, and the theatres were shut up for thirteen years. With Charles II. the drama re-appeared, and exhibited a licentiousness hardly equalled by that of any other Christian nation. No species of literature was more admired and more debased than this. From the close of the seventeenth to that of the eighteenth century British comedy was cultivated with much success by Cibber, Farquhar, Congreve, Sheridan, and others. In tragedy, during the same period, we have little to boast of, and at present the theatre of Britain is at a very low ebb.

The French drama was in a miserable state before Corneille. 'It was,' says Schlegel, 'in its childhood, and that not a healthy and promising childhood, but a crippled one.' Corneille, Racine, Molière, Voltaire, Régnier, &c., are some of the most distinguished dramatists. The theory of the unities, to which the French have so tenaciously adhered, is so opposed to what the British and Germans call true, elevated poetry, that the latter have been little satisfied with the French tragic muse, whom they consider cold, stiff, and unpoetical; but French comedy is universally admired.

The German drama is of later birth than any we have mentioned. It may be said to have made a first appearance under the care of Andreas Gryphius, but, for some time after, his countrymen contented themselves with translations and adaptations from the French. Lessing was the first who, by word and deed, broke the French sway (1755), and he was succeeded by Schiller and Goethe, who rank as the greatest of the more modern dramatists.

So much has been said about the difference between tragedy and comedy—a difference greater than exists between any other species of poetry that fall under the same general class—and the explanations of what constitutes this difference are often so unsatisfactory, that we may be excused for introducing the remarks of Schlegel on this subject in his work above mentioned:—

'Tragedy and comedy bear the same relation to one another as earnestness and mirth. Both these states of mind bear the stamp of our common nature; but earnestness belongs more to the moral, and mirth to the sensual side. The creatures destitute of reason are incapable of either. Earnestness, in the most extensive signification, is the direction of our mental powers to some aim. But as soon as we begin to call ourselves to account for our actions, reason compels us to fix this aim higher and higher, till we come at last to the highest end of our existence; and here the desire for what is infinite, which dwells in our being, is thwarted by the limits of the finite, by which we are fettered. All that we do, all that we effect, is vain and perishable; Death stands everywhere in the back-ground, and every well or ill spent moment brings us in closer contact with him. And even if a man has been so singularly successful as to reach the utmost term of life without misfortune, he must still submit to leave all that is dear to him on earth. There is no bond of love without separation, no enjoyment without grief for its loss. When we contemplate, however, all the relations of our existence; when we reflect on its dependence on an endless chain of causes and effects; when we consider that we are exposed in our weakness to struggle with the immeasurable powers of nature, and with conflicting desires on the shores of an unknown world; that we are subject to all manner of errors and deceptions, every one of which is capable of undoing us: that, in our passions, we carry our own enemy in our bosoms; that every moment demands from us the sacrifice of our dearest inclinations, in the name of the most sacred duties; and that we may, at one blow, be robbed of all that we have acquired by toils and difficulties; that, with every extension of possession, the danger of loss is proportionately increased, and we are the more exposed to the snares of hostile attack,—then every feeling mind must be filled by melancholy, against which there is no other protection than the consciousness of a destiny above this earthly life. This is the tragic tone; and when the mind dwells on the consideration of the possible as an existing reality; when that tone is inspired by the most striking examples of violent resolutions in human destiny, either from dejection of soul, or after powerful but ineffectual struggles,—then tragic poetry has its origin. We thus see that tragic poetry has its foundation in our nature, and, to a certain extent, we have answered the question, why we are fond of mournful representations, and even find something consoling and elevating in them? As earnestness, in the highest degree, is the essence of the tragic tone, the essence of the comic is mirth. The disposition to mirth is a forgetfulness of all gloomy considerations, in the pleasant feeling of present happiness. We are then inclined to view everything in a sportive light, and to admit no impressions calculated to disturb or ruffle us. The imperfections of men, and the incongruities in their conduct and relations, are no longer an object of dislike and compassion, but serve to entertain the mind. The comic poet must, therefore, carefully abstain from whatever is calculated to excite moral disgust with the conduct of men, or sympathy with their situation, because this would bring us back to a tone of earnest feeling. He must paint their irregularities as arising out of the predominance of the sensual part of their nature, and as constituting a mere ludicrous infirmity, which can be attended with no ruinous consequences. This is uniformly what takes place in what we call *comedy*, in which, however, there is still a mixture of seriousness. The oldest comedy of the Greeks was, however, entirely gay, and in that respect formed the most complete contrast with their tragedy. Not only the characters and situations of individuals were worked up into a picture of the true comic; but the state, the constitution, the gods, and nature, were all fantastically painted in the most extravagantly ridiculous and laughable colours.'

We shall now say a few words respecting the so much talked of unities in the drama. In consequence of a passage in the Poetics of Aristotle, the French, principally through the influence of Boileau, adopted the theory of the three unities in a drama—those of action, place, and time,—and this theory has recommended itself so strongly to the national taste, that a strict observance of the unities is considered by the French one of the chief merits of a dramatic production. The reader who wishes to form a correct idea of the theory of Aristotle may consult with advantage the work of Schlegel above mentioned. The French have construed it to mean, in substance, as follows:—1st, that the action of the drama must be one; the interest or attention must not be distracted by several plots, but everything must be subservient to the main action; 2dly, all the actions must take place on the same spot, or very nearly so, in order that the illusion may not be disturbed; and 3dly, everything ought to happen on the same day, for the same reason. These three rules are all true to a certain degree. The unity of action is as necessary in a drama as in any production of the fine arts; the whole must be essentially one; but the Germans and British think it absurd to confine unity of action within such narrow limits as the French do. On the contrary, as, in a picture of Raphael, many groups exist, all interesting, yet all contributing to form one great picture, and subservient to the main object of the work; so they think it not only allowable, but an excellence, to introduce a number of actions in a drama, if they are so connected as all to make but one whole. What a variety of character and action is to be found in Romeo and Juliet! and yet how closely is everything connected! how directly every scene draws towards the great tragic end! The grandeur of a lofty dome is not diminished by the statues and bass-reliefs which it may contain.

The two other unities—those of place and time—may also be too servilely followed. As for disturbing the illusion, Schiller very truly says, that everything on the stage is different from reality. Who thinks that the light of the lamps is daylight? Who, we ask, ever found such a precise square as the stage in a forest? or who ever saw people in real life turning their faces all to one point, as the actors necessarily do, that their action may be seen. The French consider it a great fault if an actor turns his back towards the audience. Is not this inconsistent? Besides, is not the very theory of unity of time, which requires all the events in a drama to happen on one day, entirely at variance with nature? and which is easier, to consider all the events represented in a drama, all the developments of the actions, as happening in one day, or to transport ourselves, in imagination, from one place to another, and suppose weeks and months to pass between the falling and rising of the curtain? Yet there is no doubt that the performance may make too great claims on our imagination. It is impossible to settle precisely the limits within which the dramatic writer should confine himself. As long as he can avoid offending the

imagination by the abruptness of his transitions, he may be considered as not having overstepped the just bounds. The liberties allowed in the drama, as in all the higher branches of art, must depend very much on the genius of the artist. Since 1816 a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the *classic*, approaches more and more to the German and British, or what is called the *romantic drama*. Madame de Staël, in her L'Allemagne, treats this subject at some length. We must refer the reader, for further information on this interesting subject, to Augustus William Schlegel's work, Ueber dramatische Kunst und Litteratur, Heidelberg, 1809 (On Dramatic Art and Literature; translated into English by John Black, London, 1815), which may be considered at once as a model of the higher species of criticism, and a specimen of German erudition and philosophy.

DRAMATIC COPYRIGHT. It is enacted by 3 and 4 Will. IV. cap. xv. that the author of any dramatic piece not printed by him or his assignee shall have as his property the sole right of representing it, or causing it to be represented, in any place of dramatic entertainment; and the author of any published dramatic piece shall have the same privilege during his life, or his asignee for twenty-eight years from the date of publication. By 5 and 6 Vict. cap. xlv. sec. 20, the provisions of the previous statute are extended to musical compositions; and the term of copyright provided for other works is applied to the liberty of performing dramatic and musical compositions. Section 21 grants to the proprietors of dramatic works the power of exacting from every offender a sum not less than forty shillings, or the full amount of the profit arising from the performance, or an equivalent to the loss sustained by the party aggrieved, provided the action is brought within a year.

DRAMMEN, or DRAM, a seaport, Norway, in a valley on both sides of the Drammen, at its mouth in the Drammenfiord, 25 miles S.S.W. Christiania. It has manufactures of leather, soap, ropes, sailcloth, earthenware, and tobacco; and is the second port in the kingdom for the export of timber, which is conveyed chiefly to Great Britain, France, and Holland. The harbour is deep enough to allow vessels to load along the quays. Pop. 14,117. The town suffered severely from conflagrations in 1850 and 1857.

DRAPERY. See COSTUME.

DRAUGHT, the depth of a body of water necessary to float a ship; hence a ship is said to draw so many feet of water, when she is borne up by a column of water of that particular depth; for instance, if it requires a body of water whose depth is equal to 12 feet to float or buoy up a ship on its surface, she is said to draw 12 feet water; and that this draught may be more readily known, the feet are marked on the stem and stern post from the keel upwards.

DRAUGHTS, a game played by two persons on a checkered board, like the chess-board, with twelve pieces to each player, placed on every alternate square on the first three lines of the board. If, as in Scotland and America, the black squares are played on, the board is so placed as to have two of those squares on the right hand side of each player, if on the white two squares of that colour must occupy the same position. The pieces are moved one square forward diagonally to the right or left until interrupted by one of the opposing pieces, or until it reaches the line of squares at the farther end of the board. In the first case if there is a vacant space on the diagonal immediately behind the opposing piece, it can be captured, which is done by leaping over the undefended piece and placing the other in the vacant square and removing the captured piece from the board; or the advancing piece may be so hemmed in that it cannot move; or again, it may be captured unless backed up by some pieces of the same colour. In the second case, on arriving at the farther end of the board, the piece becomes a king, and is 'crowned' by having another piece placed upon it; it then has the power of moving backward as well as forward. The game is ended when one party succeeds in capturing all the other 'men,' or in so hemming them in that they cannot move. Another variety of the game, known by the name of Polish, is played sometimes in Britain and America. Each player may have either twenty or forty pieces which move as in the ordinary game, but may capture backward. The king may move over any number of unoccupied squares or capture a piece or pieces at some squares' distance if not supported by pieces immediately behind them. The board is divided into 100 squares.

Draughts is known to be of very high antiquity, for in Egypt, as appears from the monumental paintings, it was a common amusement 2000 years B.C. Homer describes the suitors of Penelope as whiling away their time with draughts. The game made its appearance in Europe only three or four centuries ago, when intercourse between Europe and the Egyptian ports was frequent.

DRAVE, or DRAU, a river which rises in the Pusterthal, at the east extremity of the Tyrol, flows E.S.E. across the north of Illyria and the south of Styria, and between Hungary on the left and Croatia and Slavonia on the right, and after a course of about 300 miles joins the right bank of the Danube. In the upper part of its course it is hemmed in by mountain ridges, has a very rapid current, and owing both to this and the sudden floods which come down charged with debris, is not easily navigated. The lower part of its course is between flat banks, which, though artificially raised to a great height, it often overflows and causes great devastation.

DRAWBACK, in commerce, an allowance made to merchants on the re-exportation of certain goods, which in some cases consists of the whole, in others of a part, of the duties which had been paid upon the importation. The more common arrangement now is to put goods liable to re-exportation in a warehouse under a bond as security for the payment of the duty provided the goods are finally entered for home consumption, while if re-exported no duty is paid.

DRAWBRIDGE, a bridge with a lifting or sliding floor, used for crossing the ditches of fortresses or navigable waters where the height of the roadway is insufficient to allow vessels to pass underneath. All drawbridges are composed of two distinct parts: the movable platform and the contrivance necessary to balance it in any position. The equilibrium should be such that friction is the only force to be overcome in moving the platform. There are various kinds of this bridge.—1. The lifting bridge, which is raised on a horizontal pivot at one end. For fortifications this is the kind commonly employed, the platform forming the gate when raised. 2. Swing or turning bridges usually have their platform divided into two separate parts, each moved on pivots on the opposite sides of the channel. Another variety of this bridge has its roadway undivided and turned on a pivot working in a large hollow cylinder or pontoon placed in the middle of the stream. When lying across the channel the two ends of the platform rest freely on piers erected on either side. Rolling bridges are those which rest upon rollers and can be propelled horizontally upon them so as to close or open the water way or passage.

DRAWING is the art of representing upon a flat surface the forms of objects, and their positions and re-

lations to each other. The idea of nearness or distance is given by the aid of perspective and foreshortening. Two ancient Greeks, Ardices and Telephanes, are said to have been the first who attempted to give the idea of roundness by a combination of lines called *hatching*. Philocles and Cleanthes were the inventors of monochromes, or drawings in one colour, in which the lighter parts were produced by mixing the colour with white. This formed the transition from drawing to painting. The Greeks were very strict and precise in their teaching of drawing. Pamphilus, the teacher of Apelles, desired that his pupils should remain ten years with him receiving instruction. Linear drawing was brought by them to the highest degree of perfection. The contest between Apelles and Protogenes as to which of them could draw lines with the greatest delicacy and precision is well known.

The term Drawing, in its strict sense, is only applicable to the representing of the forms of objects in outline, with the shading necessary to develop roundness or *modelling*. Pictures in oil or water colours, though based on drawing, should be exclusively called Paintings. This distinction is observed in what follows.

The various styles of drawing may be divided into three kinds: (1) *pen drawings;* (2) *chalk drawings*, which may include lead-pencil drawing; (3) *drawings shaded with the brush or hair pencil. Pen drawings* are often confined to pure outlines; an appearance of *relief* being given by thickening the lines on the shadow side (see Pl. XLV.) *Finished* pen drawings have all the shading produced by a combination of lines termed *hatching*. Small, fine-pointed brushes are now often used instead of the pen; more delicacy and variety of tone being obtained. *Drawings shaded with the brush* are outlined with the pen, the shading being laid on or *washed in* with the brush in tints of Indian ink, sepia, or bistre. The effect realized in this manner is similar to that of the engraving—Plate XLVI. This method is used chiefly for architectural drawings and historical sketches. *Chalk drawings* are most suited for beginners, as the errors can be easily corrected. Black, red, and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity. A combination of hatching and stumping is generally preferable to adhering exclusively to either mode. There are also chalk or crayon drawings in which the leading colours of the objects represented are given lightly with different coloured crayons. This style is well suited for portraiture.

Drawings may be divided into five classes: sketches, finished drawings, studies, academic drawings, and cartoons. *First sketches* are the ideas put upon paper by an artist, with the intention of carrying them out with more completeness and detail in some more elaborate work. They are merely intended to fix and retain his first thoughts. *Finished drawings* are such as are carefully executed and made complete in all their parts. By *studies* are generally understood separate parts of objects carefully drawn either from life or from figures in relief; for example, heads, hands, feet, arms; but sometimes the term is applied to drawings of entire figures. To this class also belong drawings of the skeleton and muscles, as well as of draperies, animals, trees, foregrounds or other parts of landscapes. *Academic drawings* are those made in art academies from a living model in lamplight, which brings out the shadows more than daylight. The position of the person who serves as a model is carefully arranged at the commencement of each sitting, and in that position he is required to maintain himself. In this way the learners practise themselves in the drawing of the figure in various attitudes. In studying drapery and dress, a lay figure, made of wood and with movable joints, is clothed in various styles, and drawings made from it. *Cartoons* are drawings made on stout paper of the size of the paintings to be executed from them. They are mostly employed for pictures of large size, and are regularly used by fresco painters. The design is pricked through or traced from the cartoon upon the surface that is to receive the finished picture. See CARTOON.

The first sketches of the great masters are especially prized, because in them we find expressed most clearly the first glow of their conceptions. It is therefore much more difficult to make a copy of a first sketch with such accuracy as to deceive, than it is to make such a copy of a finished picture, for in the former case so much depends upon the freedom and facility with which the idea is expressed. The great schools of painting differ from one another as much in their drawing as in their painting. In Italy the Roman school, through Raphael's fine sense for the beautiful and expressive in form, and through his study of the antique, became the true teacher of beautiful drawing. The Florentine school tried to surpass the Roman precisely in this particular, but it lost by exaggeration what it had gained by learning and a close study of anatomy. In the Lombard school a tender style of drawing is seen through harmonious colouring, but this is rather derived from nature and instinctive feeling than attained by a close obedience to scientific principles. In the Venetian school the drawing is often veiled in the richness of the colouring, and if in some of the Venetian masters the drawing is bold and powerful, it indicates no deeper sense, no elevation or dignity, and is only imposing by its fearlessness and luxuriant fulness. The Dutch school excels in a careful and minute style of naturalistic drawing, combined with great excellence in colouring. The French school in the time of Poussin was very correct in its drawing; at a later period its style betrayed a great amount of mannerism. David introduced again a purer taste in drawing and a close study of the antique, and these are qualities which distinguish his school (the so-called classical school), from the romantic school of a later period, and the eclectic school of the present day, whose drawing is characterized by less dignity and grace, but shows more individuality and character. The modern German masters have a different style, which has been formed by an independent study of nature and of the great masters, modified by the idiosyncrasies of the German mind. The drawing of the British school is naturalistic rather than academic. It has of late years much improved in accuracy and expressiveness.

The best mode of acquiring the art of drawing is to commence by the simplest geometrical lines, proceeding to geometrical figures, from the more simple to the more complex. The student should first practise drawing accurately—perpendicular, horizontal, oblique, curved, and waved lines; then he should draw squares, triangles, circles, and ovals. These forms are the best for early instruction, because from their simplicity any inaccuracy in their delineation is easily detected. When the learner has conquered the difficulty of drawing these forms with accuracy he should proceed to draw those of a more arbitrary kind, such as the scroll and cylinder; then pyramids, obelisks, or vases, cups, books, baskets, &c., by which he will gradually become possessed of a more correct vision, and be able to give a proper degree of grace to his curved lines.

Having acquired a sufficient facility in drawing and shading these simple forms, he ought next to proceed to drawing from copies outlines of antique

busts and statues. Such subjects are well calculated to give correctness to the eye, as from their beauty and perfection any slight deviation from their just proportions instantly offends and is easily detected. On the other hand, when landscapes and flowers are used as copies, an error in drawing the irregular forms that occur in them is much less easily perceived, the student is apt to be too easily satisfied with his work, and to fall into negligent habits which cannot afterwards be easily eradicated. All these drawings should be made on a large scale, and be executed in a bold, distinct, and what painters call a *broad* style. Thus all the separate features of the face should be drawn the full size of life; for next to drawing from bad examples, nothing is a greater hindrance to proficiency than the making of small and miniature drawings.

In beginning a drawing, first get the object or objects into proper position on the paper, next into proper size, and last into proper shape. By inverting this mode of procedure learners frequently render their work very irksome, and are mortified to find that when they have matured a portion of their drawing, that the part is not truly in position, or not of the proper size. When the pupil has made a few copies of drawings of busts, statues, &c., he should next commence drawing from a model. Under this term is comprehended any object presented for imitation, whether a bust, statue, living human body, or a vase, flower, &c. The model should be placed somewhat higher than the level of the student's eye, and that the shadows may be clearly defined it should be lighted by a single lamp, or by one window, the lower shutters of which are closed. The learner's first care should be accuracy of outline; next a studious observation of the shading and shadows that give roundness and relief to objects, combined with an earnest aiming at perfect manipulation. These being mastered, boldness of touch and rapidity of execution will follow.

Chalk-drawings are generally executed on a coloured paper, for the purpose of producing a middle tint, so that a drawing on gray or stone-coloured paper will have three degrees or tones of colour —two from the chalks and one from the paper. Charcoal is used to sketch in the outline, which is then matured and made correct with Italian or hard black chalk. The shadows are laid in freely and broadly with soft black French chalk, and then softened and blended together with a stump. Chalk has many advantages over black-lead pencil; more especially it is suited for drawings of large size, and it is by practising on a large scale that freedom and accuracy of hand are mainly to be acquired.

Sketching from Nature.—Before attempting to make sketches of landscapes from nature, the student ought to be pretty well acquainted with the general rules of perspective. He may then sketch whatever pleases him, commencing with the foreground and nearest objects, and from them comparing the size and relative positions of the more distant; for instance, if a wall or building come into the foreground of the sketch, from it he may find the position of a more distant object, such as a church, by comparing horizontally what part of the wall the church is opposite, and so on, for the retiring distance. The relative positions of objects on the same plane may be determined in the same way by comparing them perpendicularly with the objects in the foreground over which they are seen. In making studies or finished sketches of single groups of rocks, trees, buildings, &c., it is best to employ black and white chalk and tinted paper. See Plates XLIV. XLV. XLVI. for illustrations of drawing the human face and figure.

DRAWING-BOARD, a board on which paper is strained for water-colour painting. It is made of a flat piece of wood held together and prevented from warping by an edging of other pieces, the grain of which runs in an opposite direction. The drawing-paper is first damped and then attached to the edges of the board with thin glue, gum, or paste, and when dry becomes perfectly tight and flat.

DRAW-PLATE, a steel plate having a series of graduated circular holes, through which metals are drawn in being made into bars or wires.

DRAYTON (Market), or Drayton-in-Hales, a market town, England, county Salop, pleasantly situated on the right bank of the Terne, and 18 miles north-east of Shrewsbury; has a church supposed to have been erected, with exception of the steeple, in the reign of Stephen; various other places of worship, and a free grammar-school founded in the reign of Philip and Mary. There are some paper and hair-cloth manufactories, tanneries, and some malting. Drayton is supposed to have been the *Caer Draithon* of the ancient Britons, and one of their principal towns. On Bloreheath, about 2 miles from the town, a sanguinary battle was fought between the houses of York and Lancaster, in which the latter were defeated. Pop. 4039.

DRAYTON, Michael, an English poet, born at Hartshill or Harshull, Warwickshire, in 1563, is said to have studied at Oxford, and afterwards held a commission in the army. His first appearance as an author was in 1591, by the publication of Harmony of the Church, containing the Spiritual Songs and Holy Hymns of Godly Men, Patriarchs, and Prophets; followed in 1593 by Idea, the Shepherd's Garland, and Roland's Sacrifice to the Nine Muses. This last is a collection of pastoral poems, and was re-issued in 1619 under the title of Eclogues. Its poetical qualities are of a very low order. Drayton's great poem, and that by which his name is chiefly remembered at the present day, is his Polyolbion, a composition in thirty books, of which the first eighteen were published in 1613, and the remainder subsequently. This work is a sort of topographical description of England, and is generally extremely accurate in its details, with, at the same time, many passages of true poetic fire and beauty. It is frequently, however, tedious and obscure, and its extreme length is sufficient to deter many from undertaking its perusal. The gem of Drayton's poems is his Nymphidia, the Court of Fairy, edited by Sir E. Brydges in 1814. His other works comprise several historical poems, such as the Barons' Wars, the Legend of Great Cromwell, the Battle of Agincourt; besides numerous legends, sonnets, and other pieces. Drayton was made poet-laureate in 1626. He died in 1631, and was buried in Westminster Abbey, where a monument has been erected to his memory.

DREAMS, trains of ideas which present themselves to the mind during sleep. It is pretty generally admitted that during sleep there is always a certain amount of mental activity, of which we may have more or less consciousness at the time and of which we may have more or less subsequent recollection. The principal feature of the state of dreaming is the absence of voluntary control over the current of thought, so that the principle of suggestion—one thought calling up another, according to the law of association—has unlimited sway. Not only can we converse in dreams with persons we fancy to be present, and listen to a coherent reply which they make to us, but we sometimes go so far as to deliver an oration or pen a treatise, which in our waking remembrance may often seem much more clearly and vigorously thought out than if we had composed them by the effort of the will. Cabanis, in his Rapports du

Physique et du Moral de l'Homme, says of Condillac, that he often brought to a conclusion in his dreams reasonings on which he had been employed during the day, and which he had not completed when he went to bed; and of Franklin, that that wise and enlightened man believed that he had been often instructed in his dreams concerning the issue of events which at that time occupied his mind. Coleridge thus describes the circumstances under which the fragment called Kubla Khan was composed:—He had fallen asleep in his chair while reading in Purchas' Pilgrimage of a palace built by Khan Kubla, and remained in that state for about three hours; during which he could not have composed less than from 200 to 300 lines, if that can be called composition in which all the images rose up before him as things, with a parallel production of the correspondent expressions, without any sensation or consciousness of effort. On awaking he instantly sat down to commit the poem to paper. After he had written the lines subsequently published, he was interrupted for a time, and when he returned to the task the poem had vanished from his memory. The cause of this coherency no doubt is, that when we are awake the attention is more liable to be withdrawn from the train of ideas by external objects. Generally, however, dreams are wanting in coherency; all probabilities and possibilities of time, place, and circumstance are violated. Nothing is more common than for the mind in dreams to combine objects and events which could have had no associated existence. The faces of friends long since dead, and events long since past rise before us sometimes with more intense vividness than in real existence, and cause no surprise by their incongruity, because the mind views them without the association of ideas which, in a waking state, would place them at such a distance from the present time that no cognizance could be taken of them except as very remote events. It is the belief we for the time possess that these trains of *ideas* are *sensations* that removes all sense of surprise and incongruity; we have not, together with these apparent sensations, the ideas of the death or the period elapsed, and we are not surprised at seeing, or believing that we see, the persons or events, any more than we would be surprised at seeing, if that were possible, the same persons or events when we are awake, if we did not know that the person had died or that the event was historical. This explanation is confirmed by those instances in which we do feel surprise. The idea of a person or event believed to be seen may call up any of the additional ideas that have before been absent. We fancy we see a person, and then we think of his death; we are immediately surprised, and we have an inner dream that we are dreaming.

Although the predisposing causes of dreams may be various, they may be generally referred to some peculiar condition of the body, and are frequently called into action through the agency of the external senses, the least excitable of which is sight, then follow taste, smell, hearing, and touch, the last being peculiarly excitable. Sensations of physical pain, including those of heat and cold, and sensations in the alimentary canal, have an important influence on dreams. Dr. Gregory relates, that having occasion to apply a bottle of hot water to his feet on retiring to bed, he dreamed of making the ascent of Mount Etna and found the heat intolerable. Dr. Reid having had a blister applied to his head dreamed of being scalped by Indians. Persons in whom one of the senses is defective, have their dreams modified by this circumstance. Deaf persons never have the impression of hearing speech, the blind never dream of visible objects, and it has been observed that a mute when dreaming appeared to carry on a conversation by means of his fingers or in writing. One notable peculiarity is that when the physical sensation influences the dream, the intensity of it, pleasurable or painful, is considerably increased. Thus if the ear be disturbed by the sounds of a flute, a thousand beautiful and pleasing associations may be invoked; the air is filled with the sounds of harps, or the combined intricate harmonies of a concerted and accompanied piece, and we may call up images of the performers themselves. The rapidity with which we dream is also remarkable. We may seem to live a weary lifetime in the dream of a minute; the sprinkling of a few drops of water on a gentleman's face produced a dream in which the events of a whole life passed before him, ending with a protracted struggle on the borders of a lake into which he was plunged. The whole process must have taken place in a second or two, as the dreamer was aroused from sleep by the application of the water. Some authorities declare that all our dreams take place when we are in process of going to sleep or become awake, and that during deep sleep the mind is totally inactive. This is denied by the majority of philosophers, and with apparent reason.

The belief that in dreams an insight is given into future events was universally prevalent in ancient times, and is shared in to some extent by intelligent people even in our day. Founding on the narratives of dreams in the Bible, and backing them up with illustrations in more recent historical times, combined with some instances that have come under their own knowledge, they construct what they consider a strong case. The non-believers in the reliability of dreams urge that, setting the scriptural instances aside, as belonging to the purely miraculous ages, there have no more dreams been prophetic than an equal number of random guesses; in fact, the wonder is that out of the thousands of dreams one has in a lifetime so few should coincide with an after event. It is also argued that if dreams were sent us as revelations, the true and the false would not be mixed up in such utter confusion, that it would be impossible to distinguish the one class from the other.

DREDGING is commonly applied to the operation of removing mud, silt, and other depositions from the bottom of harbours, canals, rivers, docks, &c. The beds of all large rivers, more particularly those which pass along comparatively flat or alluvial soils, are much encumbered in their channels by banks of sand and small gravel, while on their margins are found the finer or more minute depositions of silt and mud. Large streams, from the great body of water which they bring, and from the greater strength of their currents, will be always able to make a passage; but narrow and winding rivers, with slowly-flowing waters, are often materially injured by the depositions. To such a degree has this been experienced at Sandwich, in Kent, that that ancient seaport is left almost in the state of an inland town. The rivers of Holland, and those flowing through the plains of Italy are likewise thus affected; and according to the impurity of the waters, the entrances of docks and harbours, canals, basins, &c., are more or less silted up, and require to be cleansed or dredged.

The most simple mode of dredging, and probably the one originally adopted for removing the inequalities from the bottom of rivers and harbours, is the spoon dredging-boat. An apparatus of this description was used for dredging the harbour of Leghorn so far back as 1690. The spoon apparatus consists of a strong ring or hoop of malleable iron, about 6 or 7 feet in circumference, properly formed for making an impression upon the soft and muddy ground. To this ring is strongly attached a large bag of bullock's

hide or tanned leather, perforated with a number of small holes, with a capacity of 4 or 5 cubic feet. A long pole or handle is attached to the spoon, and a rope to the bottom of the bag, for directing their position at the commencement of each operation. The pole or handle varies in length and thickness, according to the depth of water, from 15 to 30 feet. This apparatus is generally worked with a wheel and pinion, or winch; and the chain or rope is brought from the spoon to the winch, through a block suspended from a small crane, for bearing the spoon and its contents to the side of the boat. The purchase-rope is led upon deck by a snatch-block, in the proper direction for the barrel of the winch.

The bucket dredging-machine has been generally supposed to be of British origin; and it was certainly first used in England by Mr. Rennie at Hull. It is probable that steam was not applied to the bucket dredging apparatus prior to the commencement of the present century, nor brought into general use sooner than ten or twelve years after that period. At the present day, whenever a continued necessity exists for dredging, the steam apparatus is always employed.

In Pl. XLVII. we have given an elevation and ground plan of a dredging-machine employed on the river Clyde. A short description will be sufficient to render the construction of this machine understood. A is the room in which the steam engine and boilers are contained, the engine being similar in construction to those employed in steam-packets. It is furnished with a fly-wheel for the purpose of regulating the motion. There is a spur-wheel, B, with wooden cogs, fixed on the end of the lying shaft, C C, which receives motion from a wheel on the end of the crank shaft of the engine; but as the lying shaft gives motion to the buckets, and as they may meet with some sudden obstruction, and the machinery thereby receive injury, this wheel is constructed after a peculiar manner to obviate such accidents. The wheel B has a large eye accurately turned and made to receive a nave, also accurately turned, and firmly fastened on the lying shaft. The wheel is furnished with pinching plates, by which it may be fastened to the nave, and made tighter or slacker at pleasure, in consequence of which arrangement, when the buckets meet with any sudden obstruction, the nave of the lying shaft will stop, while the cog-wheel revolves, and thus the machinery receives no strain. The lying shaft, C C, gives motion to the tumbler block E by means of the bevel-wheel D. The form of the tumbler block will be easily understood from the enlarged elevation, fig. 3, and the ground plan of the tumbler block head, fig. 4. The bucket frame, G G, is movable on an axis at the head, and suspended by chains, O, O, at the lower end, which pass round the barrel, M, seen in the ground plan, fig. 2; by turning which, the lower end, where the buckets meet the bed of the river, may be raised or depressed as the depth of the water may require. Some of these machines are capable of dredging at a depth of 27 to 30 feet. The buckets are made of iron, pointed with steel on the cutting edges, and are fastened to two strong iron endless chains which pass round the tumbling blocks at the top and bottom of the bucket frame, G G. The tumbler at the top is four-sided, that at the bottom has five sides. K is a barrel, round which the chain attached to the anchor is wound. The punt H, on which the mud, gravel, &c., falls, is seen at the stern of the vessel. Nine men are required to work one of these dredging-machines, which, it is stated, will raise on an average about 80 tons in an hour. This will vary with the nature of the bed of the river, there being more or less according as the bottom consists of gravel or clay.

DRENTHE, a province, Holland, bounded E. by Hanover, S. and W. by province Overijssel, W. by Friesland, and N. and E. by Groningen; area, 948 square miles. It is in general more elevated than the surrounding provinces, especially in the centre, from which the ground falls away on all sides; so that no streams flow into the province, but numerous small ones flow out of it on all sides. There are also several small lakes. The soil is in general sandy, and large portions of the province are covered with heath and morass; those parts which are elevated forming good land when cleared of turf, which is extensively wrought. The principal grain crops are rye and buckwheat, though barley and oats are also partially cultivated. Chicory, cole, and clover seed are also raised, and excellent flax and hops are grown. Oak, ash, linden, birch also, and other timbers, cover a considerable area. The principal wealth of Drenthe, however, is obtained from breeding horses and rearing superior cattle, sheep, swine, and poultry of all kinds. Manufacturing industry exists only to a limited extent. Drenthe is remarkable for the great number of so-called 'giants' graves' or barrows scattered over the country. Its capital is Assen. Pop. 108,056.

DRESDEN, one of the finest places of Germany, the residence of the kings of Saxony, and capital of the monarchy, on the Elbe, which separates Dresden Proper from the Neustadt (New Town). It consists of the Royal Residence or Dresden Proper, and the Neustadt (so called since 1732, and handsomely built since the time of Augustus II., formerly Old Dresden), and of Friedrichstadt (formerly Ostra, laid out since 1670). Among the objects worthy of notice are the stone bridge across the Elbe, 1420 feet long; the equestrian statue of Augustus II., erected in 1736, in the Neustadt, made of gilt bronze; the Court Church, which contains several fine pictures; among others, the Ascension of Christ, by Mengs; the famous picture-gallery; the royal library, and the cabinet of antiques, together with a collection of porcelain; the gallery of the casts of Mengs (besides the antiques); the cabinet of natural history; the arsenal, and the cabinet of works of art; the great garden; the garden of Brühl, with a small collection of pictures. The splendid theatre was completely burned down on the 21st September, 1869. It had only a twenty-eight years' existence, but in that time it had secured to itself the reputation of being one of the very best conducted institutions of the kind in the world. In the vicinity of Dresden, the Plauensche Grund (valley of Plauen) and the vale of Seifersdorf are well known to the lovers of nature. Besides these may be mentioned the royal summer residence, Pilnitz; the fortress of Königstein; the Saxon Switzerland; and the heights of Kesselsdorf, rendered famous by a battle in the Seven Years' war. The city is distinguished for its excellent literary institutions, among which are the Surgical and Medical Academy, and a veterinary school, which is connected with it; the Military Academy; the academy for noblemen, established since 1725; the New Conservatory and School of Music; the Academy of Fine Arts, with a school for architecture. The manufactures of Dresden are not important; the china, for which the city is famed, being made chiefly at Meissen, 14 miles distant. To some extent, however, there are made articles in gold and silver, mathematical and surgical instruments, which bear a good repute, straw hats and plait, artificial flowers, painters' canvas and colours, white-lead, maccaroni, musical instruments, &c. Dresden has also a foundry for casting bombs and cannon, and in the neighbourhood there are coal mines, iron and glass works, and manufactories of chemical stuffs.

Its commerce is not great, any more than its manufactures, though of late years, and since the development of the railway system, the trade with foreign parts has considerably increased. A good deal of business is done with the upper parts of the Elbe, by means of the steamers, which ply as far up as Tetschen. Three lines of railway meet at Dresden, and have their termini near each other in the Neustadt —the railway to Leipzig, that to Görlitz and Prussian Silesia, and that to Prague. There is also a short line to Freiberg. Pop. 177,089.

We may here say a few words on the collections of art. The gallery of pictures, one of the finest in the world, was begun very early, but first became of much importance under Augustus II., king of Poland, and elector of Saxony. It owes its most valuable treasures, however, to Augustus III., a prodigal monarch, who exhausted his country by his extravagances. He purchased the gallery of pictures of Modena for 912,000 dollars, and many single pictures; among them Raphael's masterpiece, the Madonna di Sisto. The gallery is rich in pictures of the different schools, with the exception of the old German. From the Dutch school there are, among others, thirty Rubens, eighteen Van Dykes, many Rembrandts, Ostades, Gerard Dows, Teniers, Wouvermanns, &c. Of the old German school, Holbein's Madonna, a sublime work, is particularly distinguished. Of the French school there are many Claude Lorraines, Poussins, Le Bruns, and others. Of the Italian school the gallery is rich in pictures of Coreggio, including his famous Night; of Raphael, the Madonna di Sisto, the Madonna della Seggiola, and others. There are also works of Leonardo da Vinci, Giulio Romano, Andrea del Sarto, Battoni, Titian (his famous Venus), Garofalo, Paul Veronese, Guido Reni, Carracci, Carlo Dolce, and every distinguished Italian painter. There are 150 pieces in pastel. This collection is liberally open every day to all visitors. Six pieces of tapestry, from designs by Raphael, a present from Pope Leo. X., which were lost, have lately been found again. The gallery of pictures in the garden of Brühl is likewise valuable. The Augusteum, or collection of antiques, was commenced as early as the sixteenth century. It contains some excellent statues, among which are distinguished three female figures from Herculaneum. The cabinet of engravings is one of the richest in the world. It contains 200,000 pieces, and the rarest productions of the art. The cabinet of casts contains copies of all the most important antiques, made under the direction of Raphael Mengs, in Italy. The collection of porcelain is valued at several millions. Dresden being thus rich in treasures of art, and favoured by a beautiful natural situation, is the summer resort of many foreigners, especially since the artificial mineral waters have been prepared in the beautiful garden of Struve.

Dresden suffered much in the Seven Years' war. In 1760 it was bombarded by Frederick the Great nine days. The Austrians occupied the city in 1809 without injuring it. In the following years they commenced pulling down the fortifications, but desisted from it on the breaking out of the Russian war. Marshal Davoust caused a pier and two arches of the bridge to be blown up (March 19, 1813), which the Russian government rebuilt in 1814. The campaign of 1813 was most ruinous for the city and its environs. From May till about the middle of September it was held by Napoleon, and severe fighting in and around the city took place almost every day. The French were eventually compelled to fall back upon Leipzig, where they suffered a decisive defeat. After nine years of war and suffering, on the 7th of June, 1815, peace and industry returned to the German Florence, as Herder calls Dresden. Since that time dwelling-houses, gardens, and parks have taken the place of the former fortifications. During the revolution of 1849 considerable damage was inflicted on the town, but since then it has been much improved.

DRESS. See CLOTHING.

DREUX (ancient, *Duroscassæ*), one of the oldest towns of France, department of Eure-et-Loir, on the Blaise, near to where it joins the Eure, 20 miles N.N.W. Chartres. It is built at the foot of a hill, crowned by a dilapidated castle; has many old buildings, among which are the parish church, an interesting Gothic edifice of the thirteenth century, with a tower of the sixteenth; and the hôtel de ville, of the sixteenth century, containing a museum of antiquity, &c. The castle above-mentioned contains a chapel, founded in 1142; to which has been added the costly mausoleum of the Orleans family, finished by Louis Philippe not long before his expulsion. Dreux has a chamber of commerce, several tanneries, and some trade in grain and other provisions. When it was founded is uncertain; but it had its own counts, and a mint, A.D. 1031. It was long the capital of the county of Drouais, now merged in department Eure-et-Loire. It was taken and ravaged by the Anglo-Normans in 1188. A sanguinary battle took place near the town in 1562, between the Royalists under Montmorency and the Huguenots under Condé, in which the latter were defeated. In 1593 Henry IV. took it by assault after an obstinate siege of eighteen days, in which its defences were much damaged; they were never repaired, and the town soon thereafter decayed. Pop. 7237.

DRIFFIELD, GREAT, a market town, England, county and 27 miles east by north of York, at the head of a navigable canal, communicating with the Humber at Hull. It consists chiefly of one large and broad street; and has an ancient parish church, several Dissenting chapels, National and other schools, a mechanics'-institute, reading-room, and dispensary. Driffield has some large flour-mills; it has also works for the manufacture of artificial manures and linseed-cake. Pop. 5067.

DRIFT SAND is sand thrown up by the waves of the sea and blown when dry some distance inland until arrested by large stones, tree roots, or other obstacles, round which it gradually accumulates until the heaps attain considerable dimensions. When these mounds have reached a certain elevation they are urged farther inland. The same wind, says Cuvier, that drives the sand from the sea upon the mound, drives the sand from its summit to its land side. In some parts of the coasts of France, the Landes in particular, these inroads upon the land have been attended with destructive consequences. The quantity of sand annually deposited along that coast is estimated at 3,000,000 cubic feet, and its annual progress inland some 72 feet. Such has been its destructive effects upon a village of Brittany that nothing is visible of it except a portion of the church steeple. For the purpose of arresting the inland progress of drift sand various measures have been adopted, the most successful being the planting of sand-loving plants with long creeping roots, such as *Carex arenaria*, which help to fix the sand and break the influence of the wind.

DRILL.—1. A tool used for boring holes in wood, metal, stone, ivory, &c. It consists of a sharp chisel to which a circular motion is communicated by means of a handle, capable of being turned round easily in a fixed stock, or by a cord, which, being moved horizontally backward and forward, causes the vertical chisel to revolve alternately in the direction of the movement. In machinery and engineering works

the drills are generally driven by the gearing of the factory. The cutting end of this tool has usually a sharp projecting pin in the centre and the edges forming the angle are bevelled in opposite directions. —2. A fine linen texture of a satiny finish, used for gentlemen's summer dresses. Plain drills are worked with five shafts, fancy patterns with eight.—3. The course of instruction in which a soldier or sailor is taught the use of arms and the practice of military and naval evolutions. It is generally considered that four months' drill is required to fit an infantry recruit for the service.—4. (*Cynocephalus leucophæus*), a species of baboon of a smaller size and less fierce disposition than the mandrill, and like it a native of the coast of Guinea. The face and ears are bare and of a glossy black colour, the palms of the hands and soles of the feet are also naked and of a deep copper colour.—5. In agriculture, a machine for sowing seeds in rows (see following article).

DRILLING is the term applied to the plan of sowing in parallel rows as distinguished from sowing broadcast. It was introduced into England by Jethro Tull, who published a work on the subject in 1731. He saw that mere ploughing and rough harrowing were not cultivation, but only its rudimentary operations; and that the soil required to be stirred and pulverized, not only before sowing, but also after the plants had appeared above ground, in order that weeds might be extirpated and fresh particles of soil brought in contact with the roots of the crop. The plan of sowing in drills or ridges, and hoeing in the intervals was therefore adopted by Tull as the best means to attain his objects. He, however, committed the mistake of fancying that finely divided earth was the food of plants, and condemned the use of manure. The advantage of sowing in drills has stood the test of experience, and drill husbandry, by combining the advantages of continued tillage with those of manure and a judicious rotation of crops, is a marked improvement on the old mode of sowing all seeds broadcast. The crops which are now generally drilled are turnips, potatoes, beans, pease, carrots, clover, cereals, flax, &c. Clover and flax are sown in drills about 3 or 4 inches apart, cereals from 6 to 10 inches, and beans, potatoes, and turnips at from 25 to 28 inches apart. The distance between the rows in the green crops is generally such as to allow the use of a light plough or horse-hoe to be drawn between them without endangering the growing plants. The first form of drill was of very simple construction, and was only adapted for sowing one row at a time. The sower pushed it before him like a small wheel-barrow. The improved form is a much more complicated instrument. It is supported on two wheels and is drawn by a horse. It sows ground bones, ashes, or any other dry manure at the same time with the seed. The seed is let gradually down from boxes in the body of the machine into furrows made by its coulters. Drilling is of more importance on dry than on moist soils, as in the former weeds are more apt to spring up and injure the crops. Among the principal advantages of drilling over broadcast sowing we may mention that a considerable saving of seed is effected in the sowing of grain crops, but the great advantage is that in the case of green crops it enables the farmer more readily to clean the land both by the hand and by the horse-hoe. To keep the soil stirred and pulverized, which can only be properly done when the crops have been drilled, favours the retention and absorption of the moisture.

DRINK. See DIETETICS.

DRIPSTONE, a projecting tablet or moulding over the head of a doorway, window, archway, or niche.

DRIVER, in navigation, a quadrilateral sail hoisted on the mizzen-gaff and stretched at bottom by a boom. It is the principal fore-and-aft sail, and is of great use in a contrary wind. Spanker is the popular nautical name for this official term.

DRIVING, CARELESS or FURIOUS. Several legislative provisions have been made with the view of preventing accidents arising from carelessness in the driving and managing of wheeled vehicles. Where a fatal accident occurs from negligence or furious driving the person in fault is held guilty of culpable homicide. By 1 and 2 Will. IV. cap. xliii. the driver of a cart, &c., is liable in a penalty not exceeding £5 for riding in the vehicle without double reins; for leaving a cart travelling on the road without a person to guide the beast; for not keeping to the left or near side of the road in passing or while being passed by another vehicle; or for wilfully preventing another person or vehicle to pass. Drivers or owners are liable in a penalty not exceeding forty shillings if more than two carts are under the management of one person; if the last of two carts has more than one horse; or if the horse of the last cart is not attached by the rein to the front cart and following in the same line not more than 6 feet behind. Owners are liable in forty shillings if the driver is under fourteen years of age. The driver of a stage-coach or such public conveyance must not quit his horses or the box, at any place where assistance can be procured before a proper person comes to hold the horses, neither must he permit any other person to drive without consent of a proprietor or against the consent of the passengers, nor quit the coach without necessity or for a longer time than necessary. Drivers of stage-coaches who occasion injury to passengers by misconduct or furious driving may be punished criminally by fine or imprisonment.

DROGHEDA, an ancient town, parliamentary borough, and seaport, Ireland, in the counties of Meath and Louth, on both sides of the Boyne, about 4 miles from the sea, 26 miles north of Dublin, with which it is connected by railway. Both portions of the town lie partly in hollows, and partly on rather steep acclivities. It consists of four principal streets, which intersect each other at right angles, and of a number of smaller, with numerous lanes and alleys. The greater number of the houses are built of brick, and are in general substantial and well constructed. Drogheda has extensive suburbs composed of miserable cabins, which greatly disfigure the approaches. Flax and cotton spinning are carried on in Drogheda or its immediate vicinity to a very considerable extent. There are also an extensive foundry, and steam-engine manufactory, breweries, a number of tanneries, several soap-works, and a ship-building yard. Drogheda carries on likewise a pretty large export trade, chiefly with Liverpool. The exports consist principally of corn, meal, flour, cattle, provisions, linen, &c.; imports of coal, manufactured goods, and colonial produce. The harbour of Drogheda is formed by the waters of the Boyne, 4 miles from the sea, and extends about half a mile below the bridge, with 16 to 18 feet water abreast the quays. At the entrance of the harbour are three lighthouses. The navigation of the Boyne for barges of 50 tons extends inland to Navan, 19 miles.

Drogheda was a principal rendezvous for the forces which were so frequently required in Ulster between the fourteenth and seventeenth centuries. On the breaking out of the rebellion in 1641 it was unsuccessfully besieged by the rebels; in 1649 it was stormed by Cromwell and its garrison put to the sword; and in 1690 it resisted the attack of a division of King William's army. Within 2 miles of its walls was fought the famous 'Battle of the Boyne.' Drogheda was also the seat of many Irish parliaments at

various periods, particularly during the fifteenth century. Pop. 16,135.

DROHOBYCZ, a town, Austria, Galicia, circle Sambor, capital of the lordship of same name, on the Tyaminnica, 41 miles s.s.w. Lemberg. It consists of the town proper and eight suburbs; contains two churches, one the handsomest in the country, a synagogue, Basilian monastery, castle, and high school; and has an important trade, chiefly with Hungary, in corn, leather, linen, earthenware, and particularly salt, obtained from salt springs in the vicinity. Near the town are also valuable iron mines and pitch wells. Pop. 16,884, of which the majority are Jews.

DROITWICH, a market town and parliamentary borough, England, in the county and 6 miles north-west of Worcester, in a narrow valley on the Salwarp; pop. municipal borough, 3504; parliamentary borough, 9510. It is supposed to have been the Salinæ of the Romans, of whom several remains have been discovered. It is still famous for its brine springs, rising near the centre of the town through strata of red sandstone and gypsum, and from which, as appears from grants to the church of Worcester, salt has been manufactured for more than 1000 years. About 30,000 tons are obtained from those brine springs, or wyches, as they are provincially termed, nearly a half of which is sent abroad.

DRÔME, a south-east department of France, with a general slope westward to the left bank of the Rhone, but covered almost throughout by ramifications of the Alps, the average height of which, however, does not exceed 4000 feet; area, 2508 square miles, of which about one-fourth is waste, one-third under wood, and a great part of the remainder under tillage and pasture, but the soil possesses little natural fertility, being thin and sandy, and the grain raised falls short of the consumption. A considerable extent of the grounds is occupied by vineyards, and several of the wines produced have a high reputation; the most celebrated being those of the Hermitage, grown near Tain, and the wines of Die, Donzère, Chateau-neuf, Montélimart, and Mercurol. In many districts the olive and mulberry tree thrive well, and large quantities of silk are obtained. Game, including chamois, hares, and partridges, abounds. The wolf is by no means uncommon, and eagles and vultures are occasionally seen. The lakes and rivers are well supplied with fish. The minerals include iron, lead, copper, and coal; limestone, gypsum, and marble, white and veined, are common. The manufactures consist of coarse woollen, serge, printed linens, gloves, leather; and there are numerous dye-works, paper, cotton, and silk mills, several roperies, brick and tile works, and blast furnaces. Drôme is divided into four arrondissements, twenty-eight cantons, and 361 communes. Pop. 320,417. Its principal river, the ancient Druna, which gives it its name, divides it nearly into two equal parts, crossing it almost centrally from east to west. It has a course of about 68 miles, through wild and picturesque scenery, and joins the left bank of the Rhone 12 miles south by west of Valence.

DROMEDARY. See CAMEL.

DROMORE, an episcopal city and market town, Ireland, county Down, on both sides of the Laggan, here crossed by two bridges, 16 miles south-west of Belfast. It consists of a square and five well-built streets, and in its cathedral, a small unpretending structure, built by its celebrated Bishop Jeremy Taylor, his remains are deposited. Pop. 2308.

DRONTHEIM. See TRONDHJEM.

DROPSY, a preternatural collection of serous or watery fluid in the cellular tissue, or different cavities of the body. It receives different appellations, according to the particular situation of the fluid.

When it is diffused through the cellular membrane, either generally or partially, it is called *anasarca;* when it is deposited in the cavity of the cranium it is called *hydrocephalus;* when in the chest, *hydrothorax,* or *hydrops pectoris;* when in the abdomen, *ascites;* in the uterus, *hydrometra;* within the scrotum, *hydrocele;* and within the ovary, *ovarian dropsy.*

The causes of these diseases are a family disposition thereto, frequent salivations, excessive and long continued evacuations, a free use of spirituous liquors (which never fail to destroy the digestive powers), scirrhosities of the liver, spleen, pancreas, mesentery, and other abdominal viscera; preceding diseases, as the jaundice, diarrhœa, dysentery, phthisis, asthma, gout, intermittents of long duration, scarlet fever, and some of the *exanthemata;* a suppression of accustomed evacuations, the sudden striking in of eruptive humours, ossification of the valves of the heart, polypi in the right ventricle, aneurism in the arteries, tumours making a considerable pressure on the neighbouring parts, permanent obstruction in the lungs, rupture of the thoracic duct, exposure for a length of time to a moist atmosphere, laxity in the exhalants, defect in the absorbents, topical weakness, and general debility.

The first of these species which we shall describe is *ascites* (from *askos,* a sack or bottle, so called from its bottle-like protuberancy), or dropsy of the belly, a tense, but scarcely elastic, swelling of the abdomen from accumulation of water. Ascites is often preceded by loss of appetite, sluggishness, dryness of the skin, oppression of the chest, cough, diminution of the natural discharge of urine, and costiveness. After the swelling has commenced it increases until the whole belly becomes uniformly swelled and tense. The distension and sense of weight vary somewhat with the position of the body, being greatest on the side on which the patient lies. As the collection of water becomes more considerable the difficulty of breathing is much increased, the countenance exhibits a pale and bloated appearance, an immoderate thirst comes on, the skin is dry and parched, and the urine is very scanty, thick, and high coloured, and deposits a lateritious sediment. The pulse is variable, being sometimes considerably quicker, sometimes slower than natural. The operation of tapping should be performed only where the distension is very great and the respiration or other important functions impeded; and it will often be best not to draw off the whole fluid at once. Great care must be taken also to keep up a sufficient pressure by a broad bandage over the abdomen, as even fatal syncope has arisen from the neglect of this. The contraction of the muscles will be promoted by friction. The remedies for this disease are cathartics, diuretics, gentle friction of the abdomen with oil, &c. Tonic medicines, a nutritious diet, and, if the complaint appears giving way, such exercise as the patient can take without fatigue, with other means of improving the general health, ought not to be neglected.

Another species of dropsy is called *anasarca* (from *ana,* through, and *sarx,* flesh). It is occasioned by a serous humour, spread between the skin and flesh, or rather by a general accumulation of lymph in the cellular system.

This species of dropsy shows itself at first by a swelling of the feet and ankles towards the evening, which for a time disappears again in the morning. The tumefaction is soft and inelastic, and when pressed upon by the finger retains its mark for some time, the skin becoming much paler than usual. By degrees the swelling ascends, and occupies the trunk of the body; and at last even the face and eyelids appear full and bloated: the breathing then becomes difficult, the urine is small in quantity, high-coloured,

and deposits a reddish sediment; the belly is costive, the perspiration much obstructed, the countenance yellow, and a considerable degree of thirst, with emaciation of the whole body, prevails. To these symptoms succeed torpor, heaviness, a troublesome cough, and a slow fever. In some cases the water oozes out through the pores of the cuticle; in others, being too gross to pass through them, it raises the cuticle in small blisters, and sometimes the skin, not allowing the water to escape through it, is compressed and hardened, and is at the same time so much distended as to give the tumour a considerable degree of firmness. In some few cases the disease goes off by a spontaneous crisis, by vomiting, purging, &c. Where the quantity of fluid collected is such as to disturb the more important functions the best mode of relieving the patient is to make a few small incisions with a lancet, not too near each other, through the integuments on the fore and upper part of each thigh; the discharge may be assisted by pressure. In the use of issues or blisters there is some risk of inducing gangrene, especially if applied to the legs; and the same has happened from scarifications with the cupping instrument. Absorption may be promoted by friction, and bandaging the parts, which will at the same time obviate further effusion, but most powerfully by the use of different evacuating remedies, especially those which occasion a sudden considerable discharge of fluids. Emetics have been often employed with advantage; but it is necessary to guard against weakening the stomach by the frequent repetition of those which produce much nausea.

Cathartics are of much greater and more general utility. Diuretics are universally proper. Digitalis is often a very powerful remedy. Opium, and some other narcotics, have been occasionally useful. In the use of diuretics the patient should not be restricted from drinking freely. It is very desirable to promote evacuation by the skin. Sometimes much relief is obtained by promoting perspiration locally by means of the vapour bath. Mercury has been much employed. Regular exercise, such as the patient can bear, the limbs being properly supported (especially by a well-contrived lace stocking), ought to be enjoined, or diligent friction of the skin, particularly of the affected parts, employed when the tumefaction is usually least, namely, in the morning. The cold bath duly regulated may also, when the patient is convalescent, materially contribute to obviate a relapse.

The next species of dropsy which we shall consider is *hydrocephalus* (from *hydōr*, water, and *kephalē*, the head), *hydrocephalum*, *hydrencephalus*, dropsy of the brain, dropsy of the head. It is sometimes of a chronic nature, when the water has been known to increase to an enormous quantity, effecting a separation of the bones of the head and an absorption of the brain. Pain in the head, particularly across the brow, stupor, dilatation of the pupils, nausea, vomiting, preternatural slowness of the pulse, and convulsions are symptoms of this disease. Hydrocephalus is almost peculiar to children, being rarely known to extend beyond the age of twelve or fourteen; and it seems more frequently to arise in those of a scrofulous and ricketty habit than in others. It is an affection which has been observed to pervade families, affecting all or the greater part of the children at a certain period of their life, which seems to show that, in many cases, it depends more on the general habit than on any local affection or accidental cause. The disease has generally been supposed to arise in consequence either of injuries done to the brain itself, by blows, falls, &c., from scirrhous tumours or excrescences within the skull, from original laxity or weakness in the brain, or from general debility and an impoverished state of the blood. With respect to its proximate cause very opposite opinions are still entertained by medical writers, which, in conjunction with the equivocal nature of its symptoms, prove a source of considerable embarrassment to the young practitioner. When recoveries have taken place in hydrocephalus we ought probably to attribute more to the efforts of nature than to the interference of art. It is always to be regarded as of difficult cure. The treatment should be prompt and active. The inflammatory action should be lessened, and then absorption promoted. After taking some blood by bleeding or by leeches the torpid bowels are to be evacuated by some active cathartic, and their activity kept up, in the progress of the complaint, by calomel or some other mercurial preparation. Mercury also contributes powerfully to rouse the absorbents. After the bowels are cleared some evaporating lotion is to be applied to the shaved scalp, and the antiphlogistic regimen observed. Sudorific medicines will generally be proper, assisted by the warm bath. Blisters may be applied to the temples, behind the ears, or to the nape of the neck. If the progress of the disease is arrested the strength is to be established by a nutritious diet and tonic medicines.

DROSERACEÆ, a natural order of exogenous plants. They are herbaceous, annual or perennial, with alternate leaves. The calyx is either monosepalous, with five deep divisions, or it has five distinct sepals. The corolla is composed of five flat and regular petals. The stamens are five in number, or some multiple of five; they are free, and alternate with the petals. The ovary is one-celled, rarely two or three-celled. The stigmas are sessile and radiating. The fruit is a capsule, with one or more cells, opening by its upper half only into three, four, or five valves. The species are marsh plants, and natives of temperate and warm climates. Some of them are natives of Britain, among others those belonging to the genus *Drosera*, or Sundew, which gives its name to the order. *Dionæa* (the genus to which the plant known as Venus' Fly-trap—*Dionæa muscipula*—belongs) and *Parnassia* are also members of this order.

DROSKY, a kind of light, four-wheeled carriage used by the Russians. It is not covered, and in the middle there rises a sort of bench placed lengthways. When there is only a single person in the drosky he generally throws one leg on each side of this bench, but the conveyance is also capable of holding two persons. The wheels are covered with wings, which keep off the mud. The term is now applied to several other kinds of vehicles.

DROSOMETER (Greek, *drosos*, dew, and *metron*, a measure), an instrument for ascertaining the quantity of dew which falls. It consists of a balance, one end of which is furnished with a plate fitted to receive the dew, the other containing a weight protected from it.

DROUAIS, Jean Germain, the most distinguished French painter of the school of David, was born at Paris in 1763. Having gone to Rome to study the great works of art there, he was, in 1784, successful in carrying off the great prize, his subject on that occasion being, The Canaanitish Woman at the Feet of Jesus. He was publicly crowned and led in triumph by his fellow-students to their master. He accompanied him as a pensioner to Rome, where he studied and copied the greatest masters. His Dying Gladiator, and particularly his Marius at Minturnæ, on being exhibited in Paris, gained for him and David's school a new triumph. He now sketched his Philoctetes at Lemnos; but his career was suddenly checked by an inflammatory fever, which put an end to his life in 1788, before he had completed his twenty-fifth year, and while he was engaged on

a picture of Caius Gracchus. His rivals and his friends united in erecting a monument to him in St. Mary's Church (in the Via Lata).

DROWNING is a mode of death produced by immersing the exterior opening of the respiratory tube in a liquid. Actual death is often preceded by apparent death (*asphyxia*, which see); and it is possible, if this state has not continued too long, to resuscitate a person apparently drowned. This circumstance has led to careful investigations of the nature of drowning, and also, in the neighbourhood of seas and large rivers, to the erection of public institutions for the resuscitation of persons apparently drowned. This kind of death furnishes, likewise, a difficult subject for medical jurisprudence, and gives occasion to the inquiry, whether a body found in the water was actually drowned, or whether life was lost in some other way; and great attention has been paid to the marks of this sort of death which are to be found upon the body. But notwithstanding all this pains, much uncertainty still hangs over the subject. This remark is true, as well of the manner in which death is the consequence of immersion as of the signs of having been drowned, and the means of resuscitating from apparent death. If a person voluntarily immerses his head in water, he perceives a roaring in his ears, a tickling in his nose, a pressure upon his breast, and a kind of stupid feeling. If a man, unable to swim, falls into the water, he instinctively makes every exertion to escape from it; he holds his breath, moves his head up and backwards, lays hold of every solid body which presents itself, and even grapples with any objects within his reach at the bottom of the water. These struggles continue a longer or shorter time, according to the strength and presence of mind of the unhappy subject; at last he sinks exhausted, becomes unconscious, strives to breathe, draws in water, and life is gone. If the body is taken from the water, it is commonly found to be very cold; the limbs are stiff, the countenance distorted, livid, and often pale, the eyes half open, the pupils enlarged, the mouth filled with foam, the breast and region of the upper stomach expanded. Sometimes the body is still warm, though it cannot be re-animated, the countenance blue and distorted, the veins of the neck much swollen. This takes place when one is drowned in alcohol, or in marshy or warm water, or when a person, in a state of intoxication, or with a full stomach, or a heated body, falls overboard. On opening the body of a person who has been drowned, the epiglottis is found to be raised, bloody foam appears in the windpipe and bronchial passages, the lungs are soft and distended, a large quantity of black fluid blood is collected in the right, and less in the left cavity of the heart, a little water is in the stomach, and the vessels of the brain are swelled with blood. Death is sometimes caused by suffocation and want of air, and sometimes as in apoplexy: in the latter case it happens very speedily, and a little water is sufficient to produce it, if the person falls upon his face. In this case, when the body is opened, the foam in the windpipe is wanting, and the vessels of the head are fuller. The various constituents of the water, such as irrespirable gases, contribute also to modify and complicate the mode of death.

The following are the directions for restoring the apparently drowned, issued by the National Lifeboat Institution, founded on the methods of Dr. Marshall Hall and Dr. Silvester (see Pl. XLVIII.):—

Send immediately for medical assistance, blankets, and dry clothing; but proceed to treat the patient instantly on the spot, in the open air, exposing the face, neck, and chest to the wind, except in severe weather, and removing all tight clothing from the neck and chest, especially the braces. The points to be aimed at are—first and immediately, the *Restoration of Breathing;* and secondly, after breathing is restored, the *Promotion of Warmth and Circulation.* The efforts to restore breathing must be commenced immediately and energetically, and persevered in for one or two hours, or until a medical man has pronounced that life is extinct. Efforts to promote warmth and circulation, beyond removing wet clothes and drying the skin, must not be made till the first appearance of natural breathing. To Restore Breathing.—Place the patient on the floor, with the face downwards, and one of the arms under the forehead, in which position all fluids will more readily escape by the mouth, and the tongue will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth. If satisfactory breathing commences, use the treatment described below to promote warmth. If there be only slight breathing, or no breathing, or if the breathing fail, then, to *excite breathing*, turn the patient on one side, supporting the head, and excite the nostrils with snuff, hartshorn, and smelling-salts, or tickle the throat with a feather, &c. Rub the chest and face warm, and dash cold water, or cold and hot water alternately, on them. If there be no success instantly, to *imitate breathing*, replace the patient on the face, raising and supporting the chest on a folded coat or other article of dress. Turn the body very gently on the side, and a little beyond, and then briskly on the face, back again, repeating these measures about fifteen times in a minute, occasionally varying the side. (By placing the patient on the chest, the weight of the body forces the air out; when turned on the side this pressure is removed, and air enters the chest.) On each occasion that the body is replaced on the face, make uniform but efficient pressure with brisk movement on the back, between and below the shoulder-blades on each side, removing the pressure immediately before turning the body on the side. During the whole of the operations, let one person attend solely to the movements of the head and of the arm placed under it. While the above operations are being proceeded with, dry the hands and feet; and as soon as dry clothing or blankets can be procured, strip the body, and cover or gradually reclothe it, but taking care not to interfere with the efforts to restore breathing. Should these efforts not prove successful in the course of from two to five minutes, proceed to imitate breathing by Dr. Silvester's method, as follows:—Place the patient on the back, on a flat surface, inclined a little upwards from the feet; raise and support the head and shoulders on a small firm cushion, or folded article of dress placed under the shoulder-blades. Draw forward the patient's tongue, and keep it projecting beyond the lips; an elastic band over the tongue and under the chin will answer this purpose, or a piece of string or tape may be tied round them, or by raising the lower jaw the teeth may be made to retain the tongue in that position. To *imitate the movements of breathing.*—Standing at the patient's head, grasp the arms just above the elbows, and draw the arms gently and steadily upwards above the head, and *keep them stretched* upwards for two seconds. (By this means air is drawn into the lungs.) Then turn down the patient's arms and press them gently and firmly for two seconds against the sides of the chest. (By this means air is pressed out of the lungs.) Repeat these measures alternately, deliberately, and perseveringly about fifteen times in a minute, until a spontaneous effort to respire is perceived, immediately upon which cease to imitate the movements of breathing, and proceed *to induce circulatim and warmth.* For this purpose commence rubbing the limbs upwards, with

firm grasping pressure and energy, using handkerchiefs, flannels, &c. (By this measure the blood is propelled along the veins towards the heart.) Apply hot flannels, bottles or bladders of hot water, heated bricks, &c., to the pit of the stomach, the armpits, between the thighs, and to the soles of the feet. If the patient has been carried to a house after respiration has been restored, be careful to let the air play freely about the room.

Cautions.—Prevent unnecessary crowding of persons round the body. Avoid rough usage, and do not suffer the body to remain on the back unless the tongue is secured. Never hold the body up by the feet. On no account place the body in a warm bath, unless under medical direction, and even then only as a momentary excitant.

General Observations.—On restoration to life a teaspoonful of warm water should be given; and then, if the power of swallowing be returned, small quantities of warm wine, or weak brandy and water, warm; the patient should be kept in bed, and a disposition to sleep encouraged. Great care is requisite to maintain the restored vital actions, and, at the same time, to prevent undue excitement. It is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance; and it is absurd to suppose that a body must not be meddled with or removed without the permission of a coroner. The following is the reason of the caution given above with respect to the use of the warm bath:—In the course of the circulation of the blood carbonic acid is produced, which must be eliminated by means of the oxygen inhaled in respiration. Now, if in the person in a state of suspended animation the circulation is stimulated by the warm bath, while respiration is not at the same time proportionally excited, carbonic acid is formed, which, not being carried off by respiration, must act as a poison on the patient. (For other cases of suspended animation see ASPHYXIA.)

DROWNING, formerly a mode of capital punishment in Europe, but now no longer resorted to for that purpose. The last person executed by drowning in Scotland suffered death in 1611, by which time this mode of punishment had already become obsolete in England. In Ireland there was an execution by drowning so lately as 1777.

DROYLSDEN, a local board district in England, in Lancashire, situated on an elevated plain, 3½ miles E. Manchester, and a station on the Lancashire and Yorkshire Railway. It consists of one principal street, irregularly laid out, and badly kept. The cottages are neatly built of brick. The principal manufacture is that of cotton goods; and there are also some copperas works, one or two small dye-works, and several extensive print-works. Pop. 6768.

DROZ, the name of three celebrated mechanicians:—

1. PIERRE-JACQUET, born at Chaux-de-Fonds in 1721. Aspiring to be something more than a mere workman, he endeavoured to perfect the different parts of clock-work, and succeeded in attaching to common time-pieces, at a small expense, machinery which produced music resembling the chime of bells, and the music of a flute. His attempts to discover the means of effecting a perpetual motion led him to important discoveries. He contrived, among other things, a pendulum, which, being composed of two metals of unequal dilatability, remained unaffected by heat or cold. He afterwards made his celebrated writing automaton, which, by means of machinery contained within the figure, was made to move its fingers and hands, and to form handsome letters. His last work was an astronomical clock. He died before this was finished, in 1790.

2. HENRI-LOUIS-JACQUET, son of the preceding, born (1752) at Chaux-de-Fonds. From his earliest youth he was employed in mechanical works. At the age of twenty-two he went to Paris with some of the products of his labour; among which was an automaton, representing a young female, which played different tunes on the harpsichord, followed the notes in the music-book with her eyes and head, and, having finished playing, rose and saluted the company. In Paris he caused one of the workmen, taught by his father, to make a pair of artificial hands for a young man who was mutilated, by means of which he was enabled to perform most of the necessary offices for himself. 'Young man,' said the famous Vaucanson to Droz, when he saw this work, 'you begin where I should be willing to end.' He died in 1791 at Naples, where he had gone for the recovery of his health.

3. JEAN-PIERRE, born in 1746; died in 1822, united himself, in 1783, with Boulton, in Birmingham, for the purpose of striking all the English copper coin. He made for the French mint a stamping-machine, which, with one stroke, and less expenditure of power than is required in the usual process, stamps both sides and the rim of coins.

DRUGGET, a coarse kind of woollen cloth, formerly used by the lower classes for purposes of clothing, but now chiefly used as a covering for carpets, or as a material for making carpets.

DRUGS, supposed to be from the root of *dry*, and hence literally signifying any dried thing, that is, dried for the purposes of pharmacy. It is the general name of substances, vegetable, animal, or mineral, used in medicine. The name is also applied to dyeing materials, and to materials used in tanning and various other arts.

DRUIDS, the priests of the Celts, or Gauls. Julius Cæsar has left more information concerning them than any other writer. According to him, they possessed the greatest authority among the Celtic nations. They were the learned men and philosophers. They performed all public and private sacrifices, explained the doctrines of their religion, distributed all kinds of rewards, administered justice at stated times, and determined the punishment which should be inflicted on offenders. Whoever opposed their decisions was excommunicated by them, and thereby deprived of all share in religious worship. They could even pronounce this curse against a whole people; and, in fact, their power had hardly any limits. They appointed the highest officers in all the cities, and these dared not undertake anything without their advice and direction. They were free from taxes and all public burdens. Instruction in religious and all other kinds of knowledge, the art of war alone excepted, was intrusted entirely to them. They gave oral instruction in the form of verses, which often had a hidden meaning, and which were committed to memory. According to Cæsar, they believed in the immortality of the soul, and its transmigration through different bodies. They taught, moreover, the nature and motions of the heavenly bodies, the magnitude of the universe and the earth, the nature of things, and the power of the gods. They also practised magic and soothsaying. According to Pliny, they were not ignorant of natural philosophy and physic. They had a wonderful reverence for the holy mistletoe, that namely which grows on the oak, on which tree the mistletoe is a rare parasite. This they looked upon as the holiest object in nature, and as a panacea; and Pliny states that at a certain period Druids clothed in white used to go into the woods and cut down the mistletoe with a golden sickle. The sacred groves of the Druids are mentioned by Lucan in the first book of his Pharsalia. They likewise esteemed the oak

sacred. The Druids had a common superior, who was elected by a majority of votes from their own number, and who enjoyed his dignity for life. Their principal seat was in Britain.

DRUM, a hollow instrument, either cylindrical in shape with a skin stretched on both ends, or hemispherical with a skin stretched over the top, from which sound is produced by beating with a stick. Cylindrical drums have wooden sides. Hemispherical ones are called kettle-drums, and have heavy brass bottoms. They are always in pairs, one drum being tuned to the key-note, and the other to the fifth of the key. An ordinary small drum is worn at the side, and is beaten with two small sticks on one end. Large cylindrical drums are called bass drums, and are carried in front. The drummer has one stick in each hand, and beats the drum on each end. The skins of drums are tightened sometimes by screws, and sometimes by cords placed at the side. The drums now furnished to the drummers in the British army have screws for the purpose. The peculiar use of the drum for military purposes seems to have been introduced among the Europeans in the time of the Crusades. The drum, as a military instrument, is used both to beat the march and to give signals. No man, who has not experienced it, can imagine the exciting power of the drum. The fatigued and exhausted soldier is at once animated by its sound; and in battle it preserves order and inspires courage in a body attacking *en colonne*. The kettle-drum, the bass drum, and other kinds of drums, are all common in the East.

DRUM, a Celtic word signifying a knoll, ridge, or small hill, frequently found alone as the name of a village, farm, estate, &c., and often also as a prefix, as in Drumalbin, Drumderg, Drumlanrig, Drumnossie, &c.

DRUM-MAJOR, in the British army, the title of the officer whose duty it is to teach and direct the other drummers, and to whom the management of the big drum belongs.

DRUMMER, the member of a British regiment whose office it is to beat the drum. In all the branches of the service he receives slightly more pay than a common soldier. It is his duty to perform the *drumming out* when a soldier is discharged from the service.

DRUMMOND, Thomas, the inventor of the lime ball light known by his name, was born at Edinburgh in October, 1797, and died at Dublin, April 15, 1840. He early displayed great mathematical ability, which induced him to follow the profession of an engineer. For this purpose, after passing through the course at the High School of Edinburgh, he went to Woolwich to receive special instruction in the duties of an engineer, and while still pursuing his studies here he showed his inventive talent by devising a form of pontoon which recommended itself by its facility of transport as well as by its admirable adaptation to the immediate purpose for which it was intended. After completing his studies he was stationed for a time in Edinburgh, and in 1820 he was invited by Colonel Colby to assist him in a trigonometrical survey he was then making of the Highlands of Scotland. During the period he was engaged on these labours he spent each winter in London, where he applied himself to the study of chemistry under Brande and Faraday. Having casually heard the incandescence of lime mentioned in a lecture, it struck him that the light produced by this incandescence might be advantageously applied to replace the Argand-lamps which were used in the surveys, and after devoting a good deal of attention to the subject, he found a means of effecting the desired object. On the first occasion on which the light was employed, in the Irish survey, begun in 1824, it showed the position of a station 66 miles distant. While on the same survey he invented a heliostat which has always been employed since in land-surveying, and with the aid of which observations can be taken at distances exceeding 100 miles. Drummond was subsequently obliged to retire from the survey on account of a severe illness which he had contracted through exposure to the climate of Ireland. He afterwards returned to his duties on the survey, but soon quitted them again to become Lord Spencer's private secretary. In 1835 he was appointed under secretary for Ireland, and in 1836 he was chairman of a commission on railways in Ireland, and gave in a very valuable report of the proceedings of the commission. A statue was erected to him in Dublin soon after his death.

DRUMMOND, William, of Hawthornden, a poet of the seventeenth century, distinguished for the elegance and tenderness of his verses, was born at Hawthornden House, on the Esk, within 7 miles of Edinburgh, 13th December, 1585. He was educated at the University of Edinburgh; after which he spent four years in foreign travels, residing for a part of the time at Bourges, to study the civil law. On his return to Scotland he resigned all idea of the law, and, retiring to his romantic seat of Hawthornden, gave himself up to the cultivation of poetry and polite literature. A dangerous illness fostered a serious and devout turn of mind, which was evinced by his first productions, The Cypress Grove, in prose, containing reflections upon death; and Flowers of Sion, or Spiritual Poems. The death of a young lady to whom he was about to be married rendered home insupportable, and drove him again abroad. He remained on the Continent eight years. In his forty-fifth year he was married, and again took up his residence at Hawthornden. Here he entertained Ben Jonson for three weeks on the occasion of a visit which the English dramatist made to Scotland in the winter of 1618–19. To this visit a great deal of interest is attached from the fact that Drummond took notes of the conversations held with Ben Jonson, which were afterwards published, though not till long after the death both of Jonson and Drummond. They first appeared in the folio edition of Drummond's works in 1711, and this circumstance frees Drummond from the charge which has sometimes been brought against him, of having committed a flagrant breach of hospitality in revealing to the world the strictures which Ben Jonson, in the confidence of private conversation, had freely passed on some of his contemporaries. These notes were republished separately by the Shakspeare Society in 1842, edited by D. Laing. He died on the 4th of December, 1649, shortly before completing his sixty-fourth year. As a historian, Drummond is chiefly remarkable for an ornate style, and a strong attachment to the High Church principles of the Jacobites. His History of the Reigns of the Five Jameses was published several years after his death. He is now remembered only as a poet. There is much sweetness and melody in his verse, and although tinged with the conceits of the Italian school, there is much genuine imagery and truth of feeling in all his poetry, but particularly in his sonnets, which are replete with tenderness and delicacy. Various editions of his poems have been published, the most recent of which are that, with his Life by Peter Cunningham (London, 1833), and that by W. B. Turnbull, 1856. An edition of his whole works was published at Edinburgh, 1711, folio, under the superintendence of Ruddiman.

DRUNKENNESS. By the law of England drunkenness is an offence against the public eco-

nomy, and a first offence is punishable with a penalty of 5*s*., to be paid to the churchwardens for the benefit of the poor; a second offence renders the offender liable to find two sureties in £10 for his good behaviour. A person who is found drunk in the public thoroughfares, or, being drunk, is guilty of riotous or indecent behaviour, is liable to a fine not exceeding 40*s*. In Scotland the laws relating to the punishment of mere drunkenness have, as a rule, fallen into abeyance, although by the General Police Act for towns (13 and 14 Vict. cap. xxxiii.), when accompanied by riotous or indecent behaviour, it is still punishable. Drunkenness is no excuse for any crime, but it renders a contract invalid if either of the parties was in a state of complete drunkenness when the contract was signed.

DRUPE, in botany, a simple succulent fruit, containing a hard kernel or stone. Peaches, cherries, &c., are drupes.

DRURY LANE THEATRE, one of the principal theatres in London, was established in the reign of James I., under the name of the *Phœnix*. In 1671 it was burned down, and was rebuilt by Sir Christopher Wren between 1672 and 1674, but again consumed, Feb. 24, 1809. On this occasion it was rebuilt by B. Wyatt, and was re-opened on the 10th of Oct. 1812, with an address composed by Lord Byron. It was in connection with this opening that the Smiths (James and Horace) wrote the Rejected Addresses. The interior was entirely rebuilt in 1822. This theatre is estimated to be capable of containing more than 3600 persons. Among the celebrated actors who have added renown to Drury Lane Theatre may be mentioned Betterton, David Garrick, John Philip Kemble, and Charles Kemble, Mrs. Siddons, and Edmund Kean. Garrick was at one time part proprietor of it, and John Kemble manager.

DRUSES, a people of Syria, inhabiting a tract of country about 2000 square miles in extent, and lying to the south of the Maronites, on the western slope of Libanus, and nearly the whole of Antilibanus. The population is estimated at from 75,000 to 85,000. In the northern parts of the districts occupied by them they are mingled with the Maronites; in the southern parts with the Greeks and Melchites, who in certain cases form the majority of the population. The number of towns and villages occupied exclusively by the Druses is about seventy in Antilibanus and nearly forty in Libanus; while the number of towns and villages in which they are mixed with other races is about two hundred. There are many circumstances which show that the Druses are not indigenous to the territory they now possess, although they have long since dropped their own language and adopted the Arabic. It is very commonly believed that they contain an admixture of descendants of the Franks who came to this region in the time of the Crusades, but this is an extremely doubtful opinion. The peculiar interest attaching to this people belongs, however, more to their political constitution and their religion than to their origin. Politically the Druses are divided into two parties, that called the Jumblatiehs, with the family of Jumblat at their head; and the Yezbekiehs, with that of Abou-Nakod at their head. These two parties live in almost constant strife, except when they have a common foe to contend against, when they forget their internal dissensions and unite their strength for offence and defence. Their religion is a curious mixture of Judaism, Christianity, and Mohammedanism. They believe in one God, who is the only being to whom worship ought to be paid. According to their religious books he cannot be defined by any of the qualities belonging to created beings. The doctrine of the unity of the Deity does not admit, in their view, even of the consideration of any quality or attribute existing in him. They profess to believe in the unity of God with the abstraction of every quality and mode of existence. The Druses also believe that God has at different times appeared to men in a human form, and that his last appearance was under the name of Hakem, of Egypt, who announced himself at Cairo as a divine incarnation about 1030 A.D. They therefore regard Hakem as God, and they believe that he will one day return to earth again, cause their religion to triumph, and punish the unbelieving. They have neither prayers, fasts, nor festivals, and, with the exception of a privileged class, the Akals, or initiated, they have no worship. When they go among the Turks they behave as Mussulmans, and in the midst of the Christian community of the Maronites they enter the Christian churches, and imitate the Christian believers in the use of the holy water. The uninitiated, called Jahils, are exempt from all religious duties whatever. The Druses have also a peculiar moral code. They have seven commandments, a number taken from the sacred writings of the Mohammedans. The following, according to Hamsa, are their seven commandments:—1, Truthfulness; 2, Mutual defence; 3, Renunciation of all other religions; 4, Separation from evil spirits and perverse men plunged in error; 5, Recognition of the unity of God at all times; 6, Contentment in all labours; 7, Patience in all circumstances. At the end of the sixteenth century this people began to excite attention in Europe. In 1588 they were made tributary to Turkey by Amurath III.; but in the beginning of the seventeenth century recovered their independence under the renowned Emir Fakreddin, and reached the summit of their power; but this leader was in 1635 strangled at Constantinople, and although other princes were placed over them, they never recovered their former reputation. They endeavoured, indeed, by the assistance of the Russians in 1773, to regain their freedom; but they were soon obliged to become again dependent on the Turks. Troubles have more than once broken out between the Druses and Maronites, &c., their neighbours. An outburst of this kind occurred in 1860, and fearful atrocities were perpetrated upon the unhappy Maronites, who, however, seem to have been the original aggressors. But a French force was sent out, and by its presence and intervention tranquillity was restored. A Christian was appointed governor of the Lebanon, June 21, 1861.

DRUSILLA, a daughter of Herod Agrippa I., king of the Jews, by his wife Cypros. She was only six years old at the death of her father, A.D. 44, but had been betrothed to Epiphanes, son of Antigonus, who, however, refused to complete the match, because one of its stipulations bound him to become a Jew. Azizus, king of Emesa, being less scrupulous, obtained her for his wife, but had not possessed her long when she divorced him to marry Felix, procurator of Judea. She is thus the Drusilla who is mentioned in the Acts, and was probably present when Paul preached before Felix. She had a son, named Agrippa, who perished in an eruption of Vesuvius.

DRUSUS, the name of several distinguished Romans, among whom were:—1. MARCUS LIVIUS (grandfather of Livia, wife of Augustus), who lived a century before Christ. Rome was then divided by the disputes of the senate and the equestrian order. The power of the latter, which, since the time of the Gracchi, had risen to its utmost height, excited the jealousy of the senate, who struggled zealously for their old but now almost lost authority. Drusus endeavoured to gain over the people to the party of the senate by the division of lands, to which the senate agreed with the utmost reluctance, and to

gain the Roman allies by the promise of citizenship. He came forward, relying on this assistance, as a mediator between the hostile parties. He proposed to supply the vacant seats of the senators with knights, and to allow the new magistrates the judicial authority which, from the time of the Gracchi, had belonged to the knights alone, but before that time to the senators. He succeeded in this plan, notwithstanding the most violent opposition from both parties. But the jealousy with which each party guarded its rights, and the rash and violent manner in which Drusus had effected the union, rendered him unpopular with both parties. When, therefore, he proposed to grant the right of citizenship to the allies, for their services to the senate, that body rejected the proposition decidedly, so that Drusus could effect nothing. On his return to his house from an assembly of the people, accompanied by a number of the Latins, he was stabbed at his door by an unknown hand, B.C. 91. He died a few hours after, exclaiming, 'When will the republic again possess such a citizen as I have been?' His death was the signal for the beginning of the social war which had been so long threatening.

2. NERO CLAUDIUS, son of Tiberius Nero and of Livia (afterwards wife of the Emperor Augustus), and brother of Tiberius, who was afterwards emperor, was sent as questor, with his brother, against the Rhætians, whom he subdued. He then suppressed an insurrection in Gaul, defeated the Germans who dwelt beyond the Rhine, passed the river, vanquished the Sicambri, and made the Frisians tributary to the Romans. He was the first Roman general who penetrated to the German Ocean. After these campaigns he became prætor (11 B.C.), but returned in the next spring to Germany, subdued many tribes as far as the Weser, and commenced the erection of fortresses. On this account he was honoured with an ovation at Rome, and was appointed proconsul; the army saluted him with the title of *imperator*, which was not, however, sanctioned by Augustus. B.C. 9 he was made consul, but returned soon after to Germany, and penetrated as far as the Elbe, but was unable to pass the river. He, however, ordered trophies to be erected there to testify his progress. He died in the same year while on his return, in the thirtieth year of his age. The canal uniting the Rhine with the Ijssel (*fossa Drusi*) was his work; and the place called Drusenheim, in Alsace, where he encamped for some time, received its name from him. By his wife Antonia he had a daughter, Livia, and two sons, Germanicus and Claudius, the latter of whom afterwards became emperor. Rome lost in Drusus a man equally distinguished in the field and the council, and one of her most virtuous and noble citizens.

DRYADS, wood-nymphs, in the Greek mythology; supposed to be the tutelar deities of trees in groves, particularly of the oak; whence their name.

DRYDEN, JOHN, one of the most eminent English poets, was descended from an ancient family in the north of England. He was born at Aldwinkle All-Saints, Northamptonshire, August 9, 1631; and received the rudiments of his education at Tichmarsh, in the same county. He was afterwards admitted a king's scholar at Westminster, under the celebrated Dr. Busby, whence he was removed to Trinity College, Cambridge. He left the university without giving any proofs of those talents for poetry for which he was afterwards so much distinguished, unless we may consider as such two or three small pieces disfigured by all the false taste of the age. The family of Dryden were thoroughly tinctured with Puritanism, and some of its members held situations of considerable distinction in the Protector's court, and he naturally imbibed the opinions of those around him. The first theme of importance for his muse was the Death of Cromwell, but the times were unfavourable for poetry. It is questionable whether this piece made any impression on the public mind. The Restoration brought the downfal of Dryden's friends and patrons. Sir Gilbert Pickering, his cousin-german, one of Charles' judges, with whom Dryden lived—in what capacity is not known, though probably in that of amanuensis or secretary—was too happy to escape into obscurity. The influence of Sir John Dryden, his uncle, ended at the same time. He was, therefore, left to find his way to distinction by his own exertions. He joined the Royalist party, and hastened to congratulate the king by publishing, in 1661, the verses entitled A Panegyric to his Sacred Majesty. In that age it was considered neither indelicate nor improper for a poet to receive gratuities from those to whom his pieces were inscribed. These, with the income of his small patrimonial estate, were probably the only means of livelihood Dryden at that time possessed. He became, therefore, anxious to form some more certain means of support than was afforded by such occasional contributions, or by literary drudgery to the booksellers. The theatres, which had been early closed by the Puritans, now newly opened, after so long a silence, were resorted to with all the ardour inspired by novelty, and seemed to offer the most promising reward. He accordingly prepared for representation the Wild Gallant, which was acted in 1662–63, but without success. Not cast down by his failure he brought forward the Rival Ladies, which was well received. His next production was the Indian Emperor, a piece ingrafted on the Indian Queen, written, or at least published by Dryden in connection with his friend Sir Robert Howard, which had been flatteringly received. The Indian Emperor at once raised Dryden to the highest pitch of public estimation, an elevation which he retained till his death.

The great fire of London put a stop for some time to theatrical exhibitions. In the interval Dryden published the Annus Mirabilis, an historical account of the events of the year 1666, one of the most elaborate of his productions, though not written in his later and more peculiar style of poetry. In 1668 he also published his celebrated Essay on Dramatic Poesy—the first attempt to regulate dramatic writing. The publication of this piece involved him in various controversies, particularly with his brother-in-law, Sir Robert Howard, who was by no means flattered by being, under the name of Crites, made, during the whole of the piece, the champion of unsuccessful opinions. They were, however, soon reconciled. The fame of Dryden was now at its height, and so confident was he of the readiness and ease with which he composed, that he entered into a contract with the king's company of players, by which he became bound to produce to them no less than three plays in the course of the year. This was, however, tasking his muse too highly, as he could only produce about half the number contracted for. In 1668 the Maiden Queen, a tragi-comedy, was represented, with what success we are not told, though the established fame of its author may warrant us in supposing it to have been well received. This was followed in 1670 by the Tempest, an alteration from Shakspeare, in which he was assisted by Sir William Davenant. It was received with general applause, notwithstanding the very questionable taste and propriety of the added characters. Dryden was shortly afterwards appointed to the offices of royal historiographer and poet-laureate, with a salary of £200 a year.

From this period till 1681 Dryden's life was passed in dramatic composition, and in repressing the

insolences occasioned by the jealousy of the small wits of the day. In this time he produced about a dozen of plays, mostly with marked success, which was only interrupted by the witty Duke of Buckingham's satirical play of The Rehearsal (published at the end of 1671), in which the heroic style of composition was satirized with a power and effect which have seldom been equalled. Long before the period referred to Dryden had become tired of the uninterrupted labours of dramatic writing, and the rivalries of Crowne and Settle, and longed for leisure to engage in an epic poem. He had even gone so far as to select a subject: but the taste of the age was against this species of composition; and the necessities of Dryden compelled him to incessant labour. Stimulated to exertion by the state of parties, he produced, in 1681, Absalom and Achithophel, a piece which for powerful yet delicate satire is perhaps unsurpassed by any poem in the language. Its success was so great, that the court party had again recourse to his pen on the release of the Earl of Shaftesbury from the Tower, and notwithstanding Dryden had already in the poem just mentioned drawn his character with unequalled power and felicity, he again, in the Medal, sketched with the same masterly hand the leading points of Shaftesbury's history, in a strain in which the beauty of the poetry added additional force to the satire. In retaliation of the slanders and petty impertinences called forth by these vigorous satires, especially those by Settle and Shadwell, Dryden published in 1682 Mac Flecknoe, in which both Shadwell and Settle are severely punished.

Shortly after the accession of James II. Dryden became a Roman Catholic, a conversion the sincerity of which has been not unreasonably regarded with suspicion, considering the time at which it occurred. Yet if the sacrifices which his staunch adherence to his new faith at the Revolution, when others of higher name changed their principles without reproach, and when adherence to them was a heavy disqualification, may be taken as evidence of his sincerity, it can hardly be questioned that Dryden was from conviction a sincere Roman Catholic. At court the new convert was received with open arms; a considerable addition was made to his pension, and his pen was put in requisition to defend the cause which he had adopted. The Hind and the Panther, a polemical poem, in which the controversy between the Romanists and Protestants is allegorically described, which affords the best specimen of the peculiar beauties of his style and its blemishes, and which raised the voice of the nation against him as the avowed defender of James' attempts at establishing arbitrary power, was his first production. It went rapidly through several editions, which is rather to be attributed to the fame of the author, and to the adventitious circumstances in which it was published, than to any disposition to acquiesce in its arguments.

At the Revolution Dryden was deprived of the offices of poet-laureate and historiographer, which were bestowed on his despised opponent Shadwell, a wretched poet, with perhaps just sufficient power of rhyme to vindicate his claim to the honours of the laurel. Deprived of the certain income which these offices secured him, at least during the reign of James, Dryden again turned his attention to dramatic composition. The unpopularity of the party with which he had connected himself, his unfortunate religious tenets, and the exertions his enemies were making for the ruin of his reputation, made him pause ere he again ventured on the stage, and caused him to bestow more care on his next piece than was usual with him. This was his tragedy of Don Sebastian, which has been regarded as the chef-d'œuvre of his plays. It was at first coolly received, though brought out with great splendour, and it was not till several retrenchments and alterations were made that it rose to that high place in public estimation which it so long maintained. His last play, Love Triumphant, was acted in 1694; it met with a very unfavourable reception, and is in truth the worst of all Dryden's compositions. During the year previous he had published, in conjunction with Congreve, Creech, and others, a translation of Juvenal, and one of Persius entirely by himself. Dryden translated Persius and about a third part of Juvenal, prefixing to the whole an essay on satire.

We now come to the production on which much of Dryden's fame depends, his translation of Virgil. On the announcement of his purpose of translating the Mantuan bard, the undertaking was hailed as a national one. Men of learning supplied various editions of the author, and contributed to his assistance in other ways; nor was the public backward in lending their aid. The subscription lists contained the names of most of the noble and learned in the land. It appeared in 1697, and so eagerly was it sought after, that a new edition was called for in the course of the first six months. This great work, which was the fruit of about three years' labour, has been pronounced by Pope, a competent judge, 'the most noble and splendid in any language.'

As if increase of years brought no abatement of poetic feeling, Dryden, now in his sixty-sixth year, had hardly finished Virgil when he distinguished himself by his immortal ode to St. Cecilia, commonly known by the name of Alexander's Feast. He also contemplated translating Homer, notwithstanding his age and ill health, and even executed some portions as a specimen. In the meantime he employed himself in the composition of his Fables, imitations of Boccaccio and Chaucer, which were published early in 1700. He survived their publication only a few months. He died May 1st, 1700, in the sixty-ninth year of his age. As if to make amends for their neglect during his life, the great and the noble now hastened to show every mark of respect to his memory. His body was removed to the Physicians' Hall, where it lay embalmed for twelve days; it was then conveyed, with considerable state, to Westminster Abbey, and deposited between the graves of Chaucer and Cowley.

Dryden married Lady Elizabeth Howard, eldest daughter of the Earl of Berkshire, and sister to his friend Sir Robert Howard. How much this added to his happiness may be questioned. Her ladyship's temper was imperious and haughty; indeed, her wayward disposition—the effect of a disturbed imagination—shortly after Dryden's death degenerated into absolute insanity, in which state she remained till her death in 1714. By her ladyship he had three sons, none of whom survived him ten years. The personal appearance of Dryden ought not to be omitted. In youth he was eminently handsome; but as he advanced in years he became corpulent and florid, which procured him, from the witty and profligate Earl of Rochester, the nickname of Poet Squab. In society he was most modest, reserved, and taciturn; his whole demeanour was characterized by a mildness which was not to be expected from his powers of satire. As a poet Dryden stands very high. What was said of Rome, adorned by Augustus, has been applied by Johnson to English poetry, improved by Dryden—he found it of brick, and left it of marble. In his hands it lost the harshness which distinguishes the writings of Donne and of Cowley, and nearly approached the harmonious numbers, the flowing versification of Pope. In Alexander's Feast he at once raised the ode to its highest elevation, denuded it of

the cerements in which his predecessors had bound it, and, in language simple and harmonious, conveys ideas of the most lofty and striking description. His power of satire is unrivalled. While the lesser poets of the day were encumbering it with foul invective, he struck out a new path in the art. His fine and delicate raillery cut deep, when the coarse weapons of his rivals would not penetrate the surface. Of his powers as a tragic poet his Don Sebastian affords the best example. His comedies are unfortunately stained by the license of the age: they possess, in general, a certain heaviness of character, a continuous flow of wit was not to be looked for from one who wrote rather for subsistence than from any peculiar taste for this species of composition. Indeed, he himself complained that he was 'forced upon composing comedies, to gratify the taste of the age, while the bent of his genius was otherwise directed.'

Of editions of Dryden's works we may refer to the prose works, by Malone (1800, four vols. 8vo); his poetical works, edited by Todd, with notes by Warton (1812, four vols. 8vo); and the whole of his works, by Sir Walter Scott (1808, eighteen vols. 8vo).

DRY PILE, a very important and useful form of galvanic battery, so named from the fact of its not requiring any considerable quantity of liquid, but merely a slight moisture among its leaves. Various kinds of dry piles are constructed. A very excellent one, Zamboni's dry pile, is made in the following way:—Some sheets of paper, covered on one side with tin-foil or silver, such as are used for ornamental purposes, are moistened with sugar and water, and then rubbed over with very finely powdered black oxide of manganese. These are laid one on the top of the other, the silvered side of one being in contact with the oxide of manganese of the next. They are then cut with a punch into discs of about an inch in diameter, and they are put into a glass tube, care being taken that the order just mentioned is preserved. The tube is fitted at each end with a brass cap furnished with a knob, and it is filled so full that the paper discs are pressed firmly together. From 1000 to 2000 discs may be used. The knob at the oxide of manganese end will be found positively electrified, the other negatively. A pile containing 2000 discs will charge a Leyden-jar.—The glass tube is generally coated with shellac varnish to improve its insulating power. The sugar with which the paper is saturated is intended for a hygrometric substance. If the pile be carefully kept it will preserve its power for many years. If it be artificially dried it loses it, but will frequently regain it when a sufficient amount of moisture has been absorbed from the air. Its action is quite similar to that of a galvanic battery, or of the Voltaic pile (which see).

DRY-POINT, a sharp etching needle for incising fine lines on a copper plate, to which neither etching ground nor acid is applied.

DRY-ROT is the term applied to a disease in wood, produced by moisture and other causes, and resulting in the development of a fungus, which spreads its mycelium, or spawn, throughout the tissues, and occasions rapid disorganization. Trees are liable to this disease when growing in wet and imperfectly-drained soil. The extensive destruction of the larch in this country is ascribed to a form of this disease. That wood in a dry state may be preserved for long periods is evident from the condition of the timber in some of the most ancient structures in the kingdom. In order to prevent dry-rot in wood, various methods have been adopted of transfusing antiseptic solutions through the vessels of the timber. When the disease has set in, no means of checking it can be depended on but the removal of the decayed and affected parts and the free admission of the air.

DSCHAKOWA, or DJAKOVA, a town in Turkey in Europe, in the N.E. of Albania, on the Grenik, 63 miles E.N.E. Scutari. It contains six mosques, a Roman Catholic and a Greek church, and above 8000 inhabitants.

DUAL, in grammar, that number which is used, in some languages, to designate two things, whilst another number (the plural) exists to express many. The dual, in some languages, is a firmly-established grammatical form, as in the Attic dialect; in other languages it is used only in certain cases with certain words, or only faint traces of it are to be recognized. The Sanskrit has a dual number. Of modern languages which have a literature, Arabic is the only idiom which has retained it. The Anglo-Saxon had a dual in the declension of the first and second personal pronouns; for example—*wit*, we two; *git*, you two; *uncer*, of us two; *incer*, of you two. In the American languages traces of the dual are very often met with from Greenland to Araucania.

DUALISM, DUALIST. Dualism is the philosophical exposition of the nature of things by the adoption of two dissimilar primitive principles, not derived from each other: such, for instance, are the ideal and the real, or the material and the thinking substance. Sir William Hamilton divides dualists into natural dualists (or natural realists), who believe that we have an immediate knowledge both of mind and matter; and hypothetical dualists (or cosmothetic idealists), who believe that we have an immediate knowledge of nothing but mind, but who nevertheless, by various reasonings and arguments, attempt to prove the real existence of an external world. In a stricter sense dualism is confined to (*a*) the adoption of two fundamental beings, a good and an evil one, as is done in the oriental religions; (*b*) to the adoption of two different principles in man, viz. a spiritual and a corporeal principle: this is called the *psychological dualism*. He who embraces this view is called a *dualist*. Opposed to the system of dualism is *monism*, which is either idealism or realism, spiritualism or materialism.

DUBARRY, COMTESSE. See BARRY (MARIE JEANNE, COMTESSE DU).

DUBLIN, a maritime county of Ireland, in the province of Leinster, on the east coast of the island, having the Irish Channel E., Meath and Kildare W., Wicklow S., and Meath N. Greatest length, N. to S., 32 miles; greatest breadth, 18 miles; area, 895 acres, or 354 square miles. Of the total area 196,063 acres are arable, and 19,132 acres are uncultivated. The chief grain crops are oats and wheat. The chief green crop is potatoes. The other crops are barley, bere, rye, turnips, mangold, &c. The surface is level, rising, at its southern boundary, into a range of elevated hills, the summit of the highest of which—Kippure—is 2473 feet above the sea. The prevailing character of the subsoil is calp limestone and granite. The elevated grounds above the coast, in the southern parts of the county, are very picturesque, and are occupied by marine villas, and by seats of the nobility and gentry. The northern districts are comparatively level and tame, but are fertile, and covered with a beautiful verdure. There are, in all, about 70 miles of sea coast, including the bays of Dublin, Killiney, Malahide, Rogerstown, and Lough Shinny. Property is much divided. Farms near the city are small, but at a distance they are larger. Agriculture is on the whole improving, but is still in a very backward state. The principal stream is the Liffey, which intersects the county W. to E. Important water communications are the Royal and the Grand Canals, both centering in Dublin, and uniting the Liffey with the Shannon. The county is not rich in minerals, and the manu-

factures are unimportant. The fisheries are extensive, and employ above 2000 men and boys. The county is traversed by four railways, which, like the canals, centre in the capital—the Kingston, Drogheda, Midland Great Western, and Great South-western. The county is divided into nine baronies—Balrothery E. and W., Castleknock, Coolock, Dublin, Nethercross, Newcastle, Rathdown, and Upper Cross; and returns two members to the House of Commons. Pop. in 1871, 405,262.

DUBLIN, the metropolis of Ireland, is situated in the province of Leinster and county of Dublin, within a mile of the bay of that name, which is of a circular form, and about 6 miles in diameter, and into which the river Liffey runs, after dividing the city, through which its course is nearly west to east, into equal parts. Though spacious, this bay is neither commodious nor safe, particularly in winter. Its defects are remedied, however, by the harbour inclosed within the north and south walls, the latter of which is a magnificent wall of stone, running out into the bay for 3½ miles from the south bank of the Liffey, and terminated by a lighthouse. Considerable additional security has been given to shipping by the erection of a harbour of refuge at Kingstown. From the point of Ringsend, where the Liffey enters the bay, it is embanked on either side with a noble wall of freestone, forming a range of beautiful and spacious quays through the whole city. The river is crossed by nine handsome bridges, seven of stone and two of iron. Dublin is, besides, nearly insulated by two canals, which give great advantages for inland communication. The houses, with the exception of the principal public structures, are generally brick, and from three to five stories high. In the old part of the city the streets are irregular, although those which range parallel to, and at right angles with, the Liffey, are uniform and capacious. The main thoroughfare, east to west, is by the magnificent quays along the Liffey, presenting, indeed, one of the finest features of the city, lined, as they are, by elegant buildings; but the stream being tidal, and the sewerage of the city being conveyed into it, ebb-tide and warm weather cause it to exhale anything but balmy odours. The principal thoroughfare, north to south, is towards the east side of the city, and is composed of Grafton Street, the busiest commercial locality in Dublin, connecting on the north by Carlisle Bridge with Sackville Street, justly esteemed the finest in the kingdom, being 650 yards, or rather more than ⅛ mile long, and 40 yards wide.

Few cities possess more numerous or more elegant public buildings. In the centre of the south side stands Dublin Castle, on a slight elevation. It was built in the beginning of the thirteenth century, and is now the official residence of the lord-lieutenant, and is more remarkable for size than for architectural features. The castle chapel is an exquisite specimen of Gothic architecture. East from the castle, and facing College Green, is the Bank of Ireland, formerly the Irish Parliament House, a large and elegant structure, the finest in the city, with a noble colonnade of Ionic pillars. At right angles to the bank, and facing the same area, is Trinity College, an imposing modern structure of the Corinthian order. The pile of buildings known as the Four Courts, stretching for 500 feet along King's Quay, on the Liffey, have a beautiful portico of six Corinthian columns, and in the centre is surmounted by a large circular lantern, with twelve windows, and twenty-four Corinthian pillars; the buildings accommodate the four courts of Chancery, Queen's Bench, Common Pleas, and Exchequer. The most important of the other public buildings, many of which are elegant, are the custom-house, with a noble cupola, 125 feet high; the King's Inns, the post-office, the royal exchange, rotunda, corn exchange, commercial buildings, linen hall, the mansion house, city assembly house, sessions house, Newgate prison, house of correction, or Richmond Bridewell; the Sheriff's prison, the North and South Union workhouses, and the stations of the Drogheda, of the Midland Great Western, and of the Great South-western Railways.

The most important literary and scientific institutions are Trinity College, already referred to; the Royal Dublin Society, for improving husbandry and other useful arts in Ireland; the Royal Hibernian Academy of Painting, Sculpture, and Architecture; and the Royal Irish Academy for Promoting the Study of Science, Polite Literature, and Antiquities; the Archæological Society, the Royal Zoological Society of Ireland, the Dublin University Philosophical Society, &c. The principal libraries, besides that of Trinity College, are Marsh's Library, containing between 17,000 and 18,000 volumes; and that of the Dublin Library Society. Adjacent to the post-office is Nelson's pillar, raised to the height of 130 feet. In the centre of College Green is an equestrian statue of William III., erected in 1701, and in front of Trinity College are bronze statues of Burke and Goldsmith, both by Foley. There are also statues of Moore, Grattan, Thomas Drummond, &c. In the Phœnix Park is an obelisk, 210 feet high, in honour of the Duke of Wellington.

Dublin contains two Protestant Episcopal cathedrals—St. Patrick's and Christ Church. St. Patrick's Cathedral is an antique building, in a low and ruinous part of the town, erected in 1190, decorated with a steeple in 1370, and a very lofty spire in 1750. Between 1860 and 1865 it was thoroughly restored. The cost, £150,000, was entirely defrayed by Sir B. L. Guinness, M.P. Christ Church, built in 1038, the ancient cathedral of Dublin, is another venerable pile, containing some curious monuments. St. George's Church is a superb modern edifice, with a magnificent front and lofty spire. No city for its size abounds more in charitable institutions. These are, in general, well endowed, and some of them are splendid buildings. They include five hospitals, among them the royal hospital for disabled soldiers, a noble edifice by Sir C. Wren; several infirmaries, among which is the lying-in hospital, the first of the kind in the United Kingdom; two lunatic asylums, one of which, St. Patrick's, or Swift's Hospital, was founded by Dean Swift, who bequeathed £10,000 for the purpose. The royal barracks, affording accommodation for 5500 men, are in the west end of the town, near the river.

A little north-west of the city, up the Liffey, is the Phœnix Park, a corruption of the Irish term *Finniske*, signifying 'a spring of clear water,' one of the most extensive and beautiful promenades of which any European city can boast. Its greatest length is about 2½ miles; greatest breadth, about 1¾ mile; area, 1759 acres. It is adorned with trees, and its surface picturesquely broken by a number of small ravines, through which streamlets seek their way to the Liffey.

The manufactures are of little note, although formerly woollen cloths, linen, and silk were manufactured in the city and vicinity to a large extent. The tabinets or poplins, a fabric of silken warp and woollen weft, for which Dublin has been long celebrated, are still in some request, though small compared to what it was formerly.

Dublin returns two members to the House of Commons. Pop. in 1861, 254,808; in 1871, 246,326.

DUBLIN, UNIVERSITY OF. The first University of Dublin was founded in 1320, but it gradually declined until, in the reign of Elizabeth, it had wholly

disappeared. The present university was founded in 1591, when a charter, or letters-patent, was granted by Queen Elizabeth for the incorporation of the 'College of the Holy and Undivided Trinity.' This college is stated in the charter to be incorporated as the 'mother of an university,' whence it appears that it was intended to be only the first of a number of colleges to be afterwards established in connection with the same university, the senate of which is incorporated by a charter distinct from that of Trinity College. Up to this time, however, no other colleges have been established in connection with this university, so that Trinity College alone still enjoys the rights of a university. A proposal to affiliate the Queen's colleges in Ireland (with the exception of Galway College) to the University of Dublin, was indeed presented to Parliament in a bill brought forward by Gladstone in Feb. 1873, but the bill was not accepted. In the charter of foundation one provost, three fellows, and three scholars were nominated to constitute, with their successors for ever, a body corporate and politic, which forms the college. The number of the corporation has been increased from time to time, and now consists of a provost, seven senior fellows, twenty-six junior fellows, and seventy foundation scholars. The management of the college is intrusted to a board consisting of the provost and senior fellows, which sits weekly. The senate of the university, as incorporated by royal charter, consists of 'the chancellor of the university, or, in his absence, of the vice-chancellor, and such doctors or masters of the university as shall have and keep their names on the books of Trinity College.' The senate possesses the right of electing the chancellor of the university, under certain conditions prescribed by the charter of incorporation. It is also the body which grants degrees. Every grace for the conferring of a degree must first, however, be sanctioned by the college board and by the caput of the senate. This latter body consists of the chancellor, vice-chancellor, provost (or vice-provost), and the senior master non-regent, and every member of the caput has the right of refusing a degree by a veto. The fellows are appointed for life. The senior fellows are promoted from the number of the junior fellows in order of seniority, and every vacancy among the junior fellows is filled up by the provost and senior fellows, after a strict examination for ten days in metaphysics, mathematics, natural philosophy, ethics, history, Latin, Greek, and Hebrew. The scholars are chosen from among the undergraduates, after an examination in mathematics and logic, or in Greek, Latin, and logic. Non-foundation scholars are not members of the corporation of the college. The scholarships, the value of each of which, everything included, is equal to about £50 per annum, are tenable for five years. Students, before being admitted, must submit to an examination in Greek, Latin, arithmetic, English composition, history, and geography. They are divided into four classes. The first consists of noblemen, noblemen's sons, and baronets who dine at the fellows' table and enjoy certain other privileges on the payment of additional charges. The second consists of the fellow-commoners, who are also required to pay additional charges and dine at the fellows' table. The third is the class of pensioners, forming the great body of the students. And the fourth is the sizars, who are partially maintained out of the college funds. These last are limited to thirty in number. The course of general instruction extends over four years. The academical year is divided into three terms—Hilary, Trinity, and Michaelmas term, and every student must keep at least two terms in each year in order to obtain a degree. Residence and attendance on lectures are not necessary to keeping terms. This may be done simply by presenting oneself on a given day for examination over a prescribed course. The system of instruction is superintended by the fellows, both junior and senior, together with a large staff of professors in the various departments of science and literature. Eighteen of the junior fellows act as tutors, and every student must place himself under one of these on entering the college. The tutors during term deliver lectures on the subjects necessary to a degree. These are:—In the first year, mathematics, Greek, Latin; in the second year, mathematics, logic and metaphysics, Greek, Latin; in the third year, logic and metaphysics, physics, Greek, Latin; and in the fourth, astronomy, ethics, mathematical and experimental physics, classics. Professional students in the fourth year are not required to take more than three of the subjects imposed on the other students, namely, astronomy, ethics, and any one of the other subjects mentioned. Students who have successfully passed all the necessary examinations in the course given above, have the degree of B.A. conferred on them by a grace of the senate in full congregation. Those who wish to obtain honours must pass through a more extended course of study. Honours are attainable in five departments: 1, mathematics and mathematical physics; 2, classics; 3, logic and ethics; 4, experimental and natural science; 5, history, political science, and English literature. Those who successfully pass the examinations in any of these departments are classed according to merit as senior or junior moderators, and respondents. Noblemen and noblemen's sons are entitled to have the degree of B.A. conferred on them *per specialem gratiam;* and fellow-commoners are entitled to receive it with one term-examination less than pensioners. The degrees are conferred on the commencement days, which are Shrove-Tuesday in Hilary term, the last Wednesday in Trinity term, and the last Wednesday in Michaelmas term. There are divinity, law, medical, and engineering schools in connection with the university, and degrees or licenses in each of these branches are granted by the university senate on the completion of the prescribed courses.

The college possesses a fine library of about 160,000 printed volumes, and 1700 manuscripts; and the number is increased annually by about 1500 volumes, which are partly purchased and partly obtained under the copyright act. It has also a well-stocked botanic garden and museum. In 1613 James I. granted to the university the right of returning two members to Parliament. One was taken away at the Union, but was restored by the reform bill of 1832. The parliamentary constituency consists of the provost, fellows and foundation scholars, ex-fellows and ex-foundation scholars, masters of arts, surgery, and engineering, and graduates holding all higher degrees.

DUBNITZA, a town in Turkey, 22 miles east by north of Ghiustendil, on the left bank of the Stroma, at the foot of Mount Dubnitza; lat. 42° 13′ N.; lon. 23° 20′ E. The inhabitants are chiefly supported by working iron mines in the neighbourhood. Silk is produced in the locality. Pop. 6000.

DUBOIS, WILLIAM, cardinal, prime minister under the Duke of Orleans when regent of France, was the son of an apothecary, and was born in 1656, in a small town in the province of Limousin. At the age of twelve years he was sent to Paris; and after having studied in the College of St. Michael he obtained the place of private tutor. He next became tutor to the Duke of Chartres, afterwards Duke of Orleans and regent. It was mainly through his influence that the duke married Mlle. de Blois, a natural daughter of Louis XIV., who was much pleased with the match, and rewarded Dubois with the

abbey of St. Just, in Picardy. Louis, who had become sensible of his talents, allowed him also to join the French ambassador at London. When he returned to France, under the modest title of a secretary, he soon became the privy-councillor of the Duke of Orleans, and overseer of his household. In 1715 the duke was declared regent; and Dubois, not less ambitious than artful, now ventured to indulge extravagant hopes. In spite of the opposition of the most influential persons, he was appointed by the duke councillor of state. The intrigues of the Spanish court, at that time under the direction of the Cardinal Alberoni, gave the duke much trouble, and made him desirous of a powerful ally. Dubois directed his attention towards England, and offered to conduct a secret negotiation with the court of that country. He succeeded in overcoming the dislike of George I. to the person of the regent, and in 1717 concluded the triple alliance between England, France, and Holland. He was rewarded by the place of minister of foreign affairs, and now began to aspire to the highest dignities of the church. The archbishopric of Cambrai having become vacant, Dubois ventured to request it of the regent, although he was not even a priest. The regent was astonished at his boldness; but as the King of England united with Dubois in his request, he obtained it, and in one morning received all the orders, and a few days after, the archbishopric. By his consummate address he obtained a cardinal's hat, and in 1721 was appointed prime minister. His power had now no bounds; but his excesses had rendered him infirm. He was scarcely able to get in and out of his carriage, and yet he appeared on horseback for the sake of receiving military honours at a review. The exertion caused an internal injury, of which he died, August 10, 1723. Dubois was an avaricious, lying, licentious creature, yet clever and industrious, and able to make himself very agreeable where it suited his interest.

DUBUQUE, a city of Iowa, United States, capital of a county of the same name, picturesquely situated on the right bank of the Mississippi, about 50 miles below the confluence of the Wisconsin. It occupies an important commercial position as an entrepôt for the agricultural and mineral products of the northern half of Iowa, and the timber of Wisconsin, and also from the valuable lead mines in its vicinity. Pop. in 1870, 18,434.

DUCANGE. See DUFRESNE.

DUCAT is a gold or silver coin. This coin and the name are derived from Longinus, a duke of Ravenna in the sixth century: the first issue of them has also been ascribed to Roger II. of Apulia, who, in 1140, coined ducats bearing the figure of Christ, and the inscription, 'Sit tibi, Christe, datus, quem tu regis, iste ducatus.' The Venetians took his ducats for their pattern in 1280, and called them *zecchini*, from Zecca, the place where they were coined. They were found to constitute a convenient medium of exchange, were adopted by Genoa, and thus came into general use. This standard of coin was also adopted in Hungary; and for a long time all foreign coins bore the name of *Ongri* or *Hungarians* in Italy, where the trade of the world was at this period concentrated. They were, in many kinds of business, the favourite standard of reckoning. They did not become so common in Germany till a much later date. The golden bull of Charles IV. gave to all the members of the empire the privilege of issuing gold coins, with any stamp they chose; but these were only gold guilders, equivalent to the favourite florin. The ducats most generally met with are the old Dutch ducats, bearing the impression of an armed figure, which gave way, for a short time only, to the figure of Louis, king of Holland. They circulated almost as merchandise, but had been frequently counterfeited in the Grisons. The counterfeits were very good to appearance, both in weight and sound. The value of the Dutch ducat (a gold coin) was about 9*s.* 9*d.* It is no longer in circulation. In the Kingdom of the Two Sicilies, before the Italian states were united into one kingdom, a silver ducat was in circulation of the value of about 3*s.* 5½*d.* A gold coin called a ducat still circulates in Austria at the value of about 9*s.* 2½*d.* In some of the South German states, and also in Hanover and Hamburg, there were formerly gold ducats of nearly the same value as the Austrian one, but since the introduction of a uniform monetary system into Germany these are no longer in circulation. Swedish gold ducats have been coined, but they are rarely met with, and have no fixed legal value. They are received at the Bank of Sweden at the same value as the Dutch ducats.

DUCATOON, formerly a Dutch silver coin worth 3 gulden 3 stivers, or 5*s.* 3*d.* sterling. There were coins of the same name in the old duchies of Tuscany and Savoy, and in the Republic of Venice. In Tuscany its value was about 5*s.* 5*d.*, in Savoy slightly more, and in Venice about 4*s.* 9*d.*

DUCHESNE, or DU CHESNE, ANDRÉ (Latin, *Chesnius, Duchenius, Quercetanus*), from his historical researches, has been called the father of French history. He was born in 1584, at Isle Bouchard, in Touraine; he studied at London and Paris, was appointed royal geographer and historiographer, and died in 1640. His most important works are his collection of French historians (Historiæ Francorum Scriptores, three vols. 1636–41, to which his son François Duchesne added a fourth and fifth from the papers left by his father); his Historiæ Normanorum Scriptores ab Anno 838–1220 (1619); and his genealogical works, which throw much light on the history of France. The number of his writings is very great; some were published by his son after his death. He left more than a hundred folios in manuscript.

DUCK. The genus *Anas*, or duck of Linnæus, included also the swans and geese, and has been broken up by later naturalists into a large number of genera, which may be divided into three groups, corresponding to the popular names above mentioned. The ducks proper are distinguished from the swans by having shorter necks; and from the geese by having shorter necks, and legs less strong and placed farther back. They also subsist largely on insects and other animal food, while the geese and swans live mostly on vegetable food. These three groups, along with the flamingoes, form the family Lamellirostres of modern naturalists. Among the ducks we may mention the *Mallard*, or *Common Wild Duck* (*A. boschas*), which is found both in Europe and America. This is the original stock of the domesticated duck, which appears to have been reclaimed at a very early period. It is found in every fresh-water lake and river of the United Kingdom, throughout the north of Europe and Asia, in the greater part of the United States, and in the West Indies. The nest is usually placed by the side of a stream or lake, or in a marsh or bog, among coarse grass, reeds, and rushes, and generally contains from twelve to sixteen eggs, of a dull greenish-white. The flesh of the wild duck is held in general estimation, and various methods are resorted to in order to obtain these birds in quantities. In Picardy, in France, vast numbers are taken in decoys and sold in the Paris market, where, in one season, 30,000 francs have been paid for the produce of the small lake of St. Lambert. They also abound in Lincolnshire, in England, and are there taken in great quantities by nearly the same means as in Picardy. Pennant had

an account sent him of the produce of ten decoys, which in one winter amounted to 32,200. We are indebted to Wilson (American Ornithology) for an enumeration of several simple and effective contrivances made use of in America for the capture of these wary birds. In some ponds frequented by them five or six wooden figures, cut and painted to represent ducks, and sunk by pieces of lead nailed to the bottom, so as to float at the usual depth on the surface, are anchored in such a position as to be within easy range of a sportsman concealed among brush, &c. These attract the passing flocks, which alight, and thus expose themselves to certain destruction. In winter, when detached pieces of ice are occasionally floating in the river, some of the sportsmen on the Delaware paint their boats white, and laying themselves flat in the bottom, direct them almost imperceptibly near a flock before the ducks have distinguished them from a floating piece of ice. On land another stratagem is sometimes practised with great success. A tight hogshead is sunk in the marsh or mud near the place where ducks are accustomed to feed at low water, and where otherwise there is no shelter; the edges and top are artfully concealed with tufts of long, coarse grass, and reeds or sedge. From within this the sportsman watches his collecting prey, and usually commits great havoc. In China the sportsman covers his head with a calabash, pierced with eye-holes, and thus equipped wades into the water, keeping only his head above the surface, and on arriving amidst a flock, seizes them by the legs, fastens them to his girdle, and thus takes as many as he wishes, without disturbing the rest.

Musk Duck, erroneously called *Muscovy Duck* (*Cairina moschata*).—This well-known bird is the largest of the duck kind, and approaches nearly to the size of a goose. It has obtained its name from a strong smell of musk which exhales from its body, and not because it comes from Russia, as has been supposed, since it is a native of South America. The musk ducks are tamed in great quantities in the West Indies, and are found wild in Guiana, where they nestle on the trunks of trees, close upon the water's edge. They feed much upon a plant called wild rice, and are difficult to approach.

Canvas-back Duck (*Fuligula* or *Nyroca vallisneria*).—This delicious bird is peculiar to America, and was known to the epicure long before it was described by the naturalist. We are indebted to Wilson for the first account of it. He gave it the name of the plant on which it feeds, and which had been called after the celebrated Vallisneri. The canvas-back ducks arrive in the United States from the north about the middle of October, and principally assemble in the numerous rivers in the neighbourhood of the Chesapeake Bay. On the Susquehannah they are called *canvas-backs*, on the Potomac *white-backs*, and on James' River *sheldrakes*. When they first arrive they are very lean; but from the abundance of their favourite food they become fat about November. They are sometimes found in such multitudes as to cover several acres. From the great demand for these ducks, and the high price they always command, various methods are employed to decoy them within gunshot. The most successful is that termed *tolling*, in which they are enticed to approach the shore by means of a dog properly trained. The canvas-back is constantly attended by another species, the American widgeon (*Mareca Americana*), which manages to make a good subsistence from his labours. This bird is extremely fond of the tender roots of that particular species of plant on which the canvas-back feeds. The wideon, which never dives, watches the moment the canvas-back rises, and before he has his eyes well opened, snatches the morsel from his mouth, and makes off.

Among other species of ducks are, *Rhyncaspis clypeata*, or shoveller, remarkable for the strange form of its bill. *Chaulelasmus strepera*, or gadwall, which is more rare in America than in Europe. *Dafila acuta*, pintail or sprigtail, remarkable for the form of its tail; abundant in both hemispheres. *Anas obscura*, black or dusky duck, peculiar to America, and very abundant; this is perhaps the most sagacious and timid of all the American ducks. *Aix sponsa*, summer or wood duck; not more remarkable for its great beauty, in which it stands pre-eminent, than for its habits, its migrations being directly opposed to those of the other species. *Querquedala crecca*, or teal. (See TEAL.) *Somateria mollissima*, eider-duck (which see). *Oidemia fusca*, velvet duck, found in both hemispheres; its flavour is rank and fishy, and it is therefore seldom sought after. *O. nigra*, scoter; found both in Europe and America; these birds, and a few others of the same fishy flavour, are exempted from the interdict which forbids Roman Catholics the use of animal food on certain days, on the supposition of their being cold-blooded and partaking of the nature of fish. *Nyroca* or *Fuligula ferina*, pochard or red-head; common to both continents; it approaches very near to the canvas-back in delicacy; its usual weight is about 1¾ lb. *Fuligula marila*, scaup-duck or blue-bill, a well known and common species in both continents. *Harelda glacialis*, long-tailed duck, or old wife; common to both continents, remarkable for the long and slender middle feathers of its tail. *Clangula histrionica*, harlequin-duck; a magnificent species found on both continents; it derives its name from the singularity of its markings; along the coast of New England it is called the *lord*.

DUCK, a sort of strong, brown, linen cloth, highly glazed, used chiefly by sail-makers.

DUCK-BILL, or DUCK-MOLE. See ORNITHORHYNCHUS.

DUCKING-STOOL. See CUCKING-STOOL.

DUCKWEED (*Lemna*, Linn.), a genus of plants, by some botanists made the type of the small order *Lemnaceæ*, by others considered as belonging to the sub-order *Lemneæ* of the natural order *Araceæ*. The species are small plants which float on the surface of stagnant ponds or slow running streams. The fronds take the place both of stems and leaves, and are usually of a bright green colour. The flowers arise from a slit just below the margin of the frond. Four species are found in Britain, which are distinguished from one another by the shape of their fronds.

DUCKWORTH, SIR JOHN THOMAS, a British admiral, born at Leatherhead, in Surrey, in 1747 or 1748, entered the navy in 1759. Between 1776 and 1779 he served in America. In 1793, on the breaking out of the French war, he was appointed to the command of the *Orion*, 74, forming part of the Channel fleet under Lord Howe, and distinguished himself in 1794 in the great naval victory gained by that celebrated admiral. In 1798, while commanding the *Leviathan* in the Mediterranean under Earl St. Vincent, he acquired new fame at the capture of Minorca. Some years later, when he had obtained the rank of vice-admiral, he was cruizing off Cadiz as second in command to Lord Collingwood, and set out in a French fleet which had sailed to the West Indies with the view of succouring St. Domingo. He came up with it after effecting a junction with Admiral Cochrane, and succeeded in capturing an 80 and three 74 gun ships. For this service he received the thanks of both houses of Parliament, and was presented by the city of London with its freedom and a sword of the value of 200 guineas; and by the assembly of Jamaica with thanks and a sword of the value of 1000 guineas. In 1807, having been ap-

pointed to watch the Turkish fleet, he forced the passage of the Dardanelles, but found considerable difficulty in returning, and sustained some damage. Between 1810 and 1815 he was Governor of Newfoundland. In 1813 he was created a baronet. He sat in Parliament for some time as one of the members for South Romney, and died in 1817.

DUCLOS, CHARLES PINOT (not PINEAU, according to Jal), a French novelist, writer of memoirs, and grammarian, born in 1704 at Dinant. He received a good education at Paris, early turned his knowledge to profit, in 1739 was chosen member of the Academy of Inscriptions, and in 1747 member of the French Academy, of which he was afterwards appointed permanent secretary. Though he resided at Paris he was elected mayor of his native town in 1744. When the states of Bretagne, in reward of their zeal for the welfare of the kingdom, were permitted to nominate such of their number as they thought most worthy of the royal favour, Duclos was unanimously elected one of the number, and in 1755 received letters of nobility. He had already in 1750 been appointed to succeed Voltaire as historiographer of France. He died at Paris, 1772. Among the best of his novels are Confessions du Comte de B... (1741). His Considérations sur les Mœurs de ce Siècle are full of striking sketches of character and deep knowledge of human nature. His History of Louis XI. is esteemed, but shows the hand of the novelist. Of more value are his Mémoires secrets sur les Règnes de Louis XIV. et XV. This work was composed in his character of historiographer. He also distinguished himself in his Remarques sur la Grammaire générale de Port-Royal as a grammarian. His complete works were published at Paris in 1820 in nine vols.

DUCROTAY DE BLAINVILLE. See BLAINVILLE (HENRI MARIE DUCROTAY DE).

DUCTILITY, the extensibility and cohesion of particles, which enables metal to be drawn into wire without breaking. The ductility of some bodies, especially of gold, is very surprising. A single grain of gold may be stretched under the hammer into a leaf that will cover a house, and yet the leaf remain so compact as not to transmit the rays of light, nor even admit spirit of wine to transude. But M. Réaumur has shown the ductility of gold to be still greater. What is called *gold wire*, everybody knows, is only silver gilt. The cylinder of silver, covered with leaf-gold, is drawn through the hole of an iron, and the gilding is extended with the wire to whatever length it may be stretched. Now M. Réaumur shows that in the common way of drawing gold wire a cylinder of silver, 22 inches long, and 15 lines in diameter, is stretched to 1,163,520 feet, or is 634,692 times longer than before, which amounts to about 97 leagues. To wind this thread on silk for use it is first flattened, in doing which it stretches at least one-seventh further, so that the 22 inches are now 111 leagues; but in the flattening, instead of one-seventh, it could be stretched one-fourth, which would bring it to 120 leagues. This appears a prodigious extension, and yet it is nothing to what this gentleman has proved gold to be capable of.

Ductility of Glass.—When glass is penetrated with the heat of fire it can be managed like soft wax, and may be drawn out into threads exceedingly long and fine. Ordinary spinners do not form their threads of silk, flax, or the like, with half the ease and expedition the glass-spinners do threads of this brittle matter. Some of them are made into plumes, and used in other works; they are made much finer than hair, and bend and wave, like hair, with every wind. Two workmen are employed in making them: the first holds one end of a piece of glass over the flame of a lamp, and when the heat has softened it the second operator applies a glass hook and draws out a thread of glass, which still adheres to the mass; then fitting his hook on the circumference of a wheel about 2½ feet in diameter, he turns the wheel as fast as he pleases till it is covered with a skein of glass thread. The parts, as they recede from the flame, by gradually cooling become more cohesive: the parts nearest the fire are least cohesive, and consequently must give way to the effort made to draw them towards the wheel. These threads are commonly of a flat, oval shape, being three or four times as broad as thick; some of them seem scarcely bigger than the thread of a silk-worm, and are surprisingly flexible. If the two ends of such threads are knotted together they may be drawn and bent till the aperture or space in the middle of the knot does not exceed one-fourth of a line or one forty-eighth of an inch in diameter. The flexibility of glass increases in proportion to the fineness of the threads; and, probably, had we the art of drawing threads as fine as a spider's web, we might weave stuffs and cloths of them, but could never make them long enough to be serviceable. For further information see DIVISIBILITY.

DU DEFFANT, MADAME. See DEFFANT.

DUDLEY, a town of England, in an isolated part of Worcestershire, inclosed by Staffordshire, 8 miles west by north of Birmingham, on the South Staffordshire Railway. Among its institutions are a mechanics' institute and a geological society, with a museum rich in specimens derived from the mineral fields. The coal fields in the neighbourhood of Dudley are extensive, and the iron mines are numerous. The principal trade of Dudley consists in the smelting and working of iron; boilers, chain-cables, fire-irons, fenders, vices, spades, scythes, and nails, being the principal articles made. Flint-glass is also extensively manufactured, and beautiful ornamental articles of fossiliferous limestone, with which the vicinity abounds, as it does also with coal and ironstone. The immense caverns wrought into the limestone rock are very remarkable, and particularly interesting to the geologist. There are here the remains of an ancient castle, finely situated on a height overhanging a ravine, and said to have been founded in the eighth century by a Saxon prince called Dudo or Dud, who has given the town its name. Dudley returns one member to Parliament. Pop. of municipal borough in 1871, 43,782; of parliamentary borough, 82,249.

DUDLEY, the name of a celebrated English family which derives its origin from Sir John Sutton, who about 1320 married the sister and heiress of John de Sommerie, lord of the manor of Dudley, and his son John de Sutton was in 1342 called to the Upper House as Baron Dudley. John de Sutton, fourth lord Dudley, was one of the bravest generals of Henry VI. in the wars of the Roses, for which he was rewarded with the order of the Garter. He afterwards submitted to Edward IV., and died in 1482. He had two sons, Edward and John, the first of whom died before his father, leaving the second to inherit the title. This John, fifth lord Dudley, made the titular designation of the family the family name, and became the founder of a line which played an important part in English history. His second son, Sir John Dudley, was the father of Sir Edmund Dudley, the minister of Henry VII. He, again, was the father of John Dudley, Viscount Lisle, afterwards duke of Northumberland, who played such a conspicuous part in the reign of Edward VI. Of the five sons of the Earl of Northumberland, the fifth, Robert, is the famous earl of Leicester, the favourite of Queen Elizabeth. The fourth, Lord Guildford Dudley was the husband of Lady Jane Grey, and

was executed with her in 1553. The title of Lord Dudley passed down through the eldest son of John, fifth lord Dudley, to a line which did not become extinct till 1833, on the death of John William Ward, first earl of Dudley, foreign secretary in the Canning ministry. The title had passed to the Wards by the marriage of Frances, granddaughter of the ninth Lord Dudley, with Humble Ward, a wealthy citizen of London, who was made a baron in 1644 by Charles I. The title of Earl of Dudley was renewed in 1860 in favour of a member of the Ward family, in no way connected with the ancient Dudley family.

DUDLEY, Dud, is famous in the history of iron-smelting as the first who succeeded in making cast and wrought iron with pit-coal instead of charcoal. In 1665, at the instigation of his nephew, he published a work entitled Metallum Martis, in which he gave a narrative of his invention, and all the subsequent trouble he experienced and the losses he sustained in trying to introduce his iron. In 1619, at the age of twenty, he was removed from Balliol College, Oxford, which he was then attending, and set over iron works of his father's in Worcestershire, and being aware of previous futile attempts to make iron with coal, he altered a furnace, and succeeded even in his first trials. He then got a patent from King James, but his iron was disparaged by the other masters, and they were only silenced by actual comparisons. After the expiry of his patent he encountered fresh opposition, but he built a new furnace, and turned out seven tons per week, the largest quantity that had ever been made with coal. Riots ensued and rattening, his bellows were cut, he suffered great losses, and was imprisoned for debt. He then got a fresh patent from Charles I. and floated a joint-stock company, but operations were stopped by the wars. Afterwards a great many different companies were started hoping to succeed, but, according to Dudley, nothing but failures ensued, and the attempt was so universally abandoned, that in 1660 he, being then sixty-one years of age, attempted to get his patent revived, but without success at the time he wrote his work. Hence he wrote, 'Must I still be opposed, and never enjoy my inventions, nor Great Britain the benefit? Must my patent be obstructed in peace, as it was extinct by the wars? And must not my patent be revived for the making of iron with pit-coal, sea-coal, peat, and turf, but find enemies still to oppose it? How many thousand tons of iron might have been made but since my first invention, An. Jacob. 18th, by my means with pit-coal, and sea-coal (lost) if I had not had enemies; and had not wood and timber been preserved?' This latter proposition he then demonstrates in the concluding part of his writing, for early in the seventeenth century it was feared that the preparation of charcoal would so strip the country of timber, that none would be left for ship-building.

What would be the tenor of Dudley's reflections were he to know that, two hundred years later, on the manufacture of iron by pit-coal for which he had wrestled, Great Britain's naval superiority would depend more closely and directly than he had ever imagined, while the saving of the said pit-coal, after barely fifty years' consumption in the manufacture of the iron, should be the source of as great anxiety to the nation and manufacturer as ever was the saving of ship-timber in the days of Queen Elizabeth?

DUDLEY, Sir Edmund, noted in English history as an instrument of Henry VII. in the arbitrary acts of extortion practised during the latter years of his reign. He was born in 1642, of an ancient and respectable family; and was educated at the University of Oxford. Becoming a student of the law at Gray's Inn, he arrived at such eminence in his profession as recommended him to the favour of Henry VII., who made much use of his services, and conferred on him various offices and emoluments. About 1504 or 1505 he was made speaker of the House of Commons, and through his influence several enactments took place, oppressive to the people and profitable to the monarch. On the accession of Henry VIII. he was arrested for high treason, and perished on the scaffold, August 18, 1510, with his associate Sir Richard Empson.

DUDLEY, John, Duke of Northumberland, son of Sir Edmund Dudley, minister of Henry VII. He was born in 1502, and after his father's execution was restored in blood by act of Parliament. In 1543 he was raised to the peerage as Viscount Lisle, in right of his mother, who inherited that title. Soon after he was made K.G., and at length the post of lord high-admiral was conferred on him for life. He served with reputation in Scotland and France, and was left by Henry VIII. one of the executors named in his will, as a kind of joint-regent during the minority of Edward VI. Under that prince he manifested the most insatiable ambition, and obtained vast accessions of honours, power, and emoluments. At first he joined his interest with that of the Duke of Somerset, the king's uncle, whom, however, at length he undermined and destroyed. He had been advanced to the titles of Earl of Warwick and Duke of Northumberland; and after the fall of his rival his authority was almost unbounded. The illness of the king, over whom he had gained complete ascendency, aroused his fears, and he endeavoured to strengthen his interest by marrying his son Lord Guildford Dudley to Lady Jane Grey, descended from the younger sister of Henry VIII., and persuaded Edward to settle the crown on his kinswoman by will, to the exclusion of his two sisters, the Princesses Mary and Elizabeth. The death of the king, the abortive attempts to place Lady Jane Grey on the throne, and the ruin of all those concerned in the scheme, are among the most familiar events in the annals of England. Northumberland himself was beheaded on Tower Hill, August 22, 1553. He professed himself a Catholic a short time before his execution, and died in that faith, though the avowed object of the plot was to secure the establishment of Protestantism in England.

DUDLEY, Robert, Earl of Leicester, was the fifth son of the Duke of Northumberland, and was born about 1532. He was knighted when young, and was made gentleman of the bed-chamber to Edward VI. Though involved in the criminal designs of his father, and included in the sentence of attainder passed against him on the accession of Mary, he was pardoned and employed by that queen. After Elizabeth ascended the throne Dudley soon acquired the distinction of being her favourite. Offices, honours, and wealth were showered on him with an unsparing hand. He was appointed master of the horse, knight of the Garter, and privy-councillor; and he received grants of the princely domains of Kenilworth, Denbigh, and Chirk Castle. In 1560 the death of his wife took place at Cumnor Hall, in Berkshire. This event, according to popular opinion, as appears from Aubrey, involved Dudley in the guilt of murder. If he sacrificed the life of his consort in the hope of marrying the queen, his ambitious views were disappointed. Elizabeth, however, encouraged him to aspire to the hand of Mary of Scotland, not meaning he should obtain it. In 1564 he was created Baron Denbigh and Earl of Leicester, and was the same year elected chancellor of Oxford University, having previously been chosen to the same office at Cambridge. About 1572 he appears to have married the baroness dowager Sheffield, Lady Douglas Howard,

by whom he had children, but whom he disowned as his wife, and even compelled to marry another person. In 1575 he gave a princely entertainment to the queen at Kenilworth Castle, the festivities of which are described in a picturesque manner in Scott's celebrated romance of Kenilworth, and, in defiance of chronology, connected with the death of Leicester's first wife. Leicester in 1578 offended the queen by his marriage with the widow of Walter Devereux, earl of Essex. He, however, recovered her favour, and in 1585 was appointed, through her influence, governor of the Netherlands, then recently emancipated from the Spanish yoke. His conduct in this station did not give satisfaction to the queen, or to the states over which he presided, and he was recalled the following year. He returned to his command in June, 1587, but he was finally displaced a few months after, and returned to England. He was accused of misconduct by Lord Buckhurst and others, but Elizabeth still retained so much partiality for him that she supported him against all his enemies; and on the prospect of the Spanish invasion in 1588 she appointed him commander of the forces assembled at Tilbury for the defence of the kingdom. Leicester died September 4, the same year, at Cornbury Park, in Oxfordshire, and was interred in a chapel of the collegiate church of Warwick, where a splendid monument was raised to his memory.

DUEL (from *duellum*, derived from *duo*) is a combat between two, at a time and place appointed, in consequence of a challenge, and so is distinguished from an encounter taking place without any previous arrangement. The custom of duelling was derived from the northern nations; the judicial combat and the private duel, upon the principle of the point of honour, having both been unknown to the ancients. The Germans, Danes, and Franks carried the practice of the judicial combat so far that none were excused except women, sick people, cripples, and such as were over sixty years of age. Even ecclesiastics and monks were obliged to maintain their controversies by a champion in arms; and this singular species of jurisprudence was not confined to criminal accusations, but the titles to estates were decided in the same manner. At length, however, this mode of trial was limited to those accusations of capital offences in which there was no other testimony, and in which common fame pronounced the accused party to be guilty. The party vanquished was punished by hanging, beheading, or mutilation of members. A judicial combat was authorized by Gundebald, king of the Burgundians, as early as A.D. 501. Fleta (bk. i. ch. 32) says it is a combat between two to prove the truth in respect to their controversy, and the party who conquers shall prevail in the suit. The practice of trying rights to land, as well as the guilt or innocence of an accused party, by combat under judicial authority, very naturally suggested the decision of personal quarrels in the same way (particularly those in which the point of honour was concerned), and all cases in which there was no adequate redress provided in the ordinary tribunals.

The example of Francis I. of France and Charles V. of Spain gave a sanction to this mode of arbitration. On the breaking up of the treaty between these sovereigns and the declaration of war by the French and English heralds at the court of Charles, Jan. 2, 1528, the emperor, in replying to the declaration of the French monarch, desired the herald to acquaint his sovereign that he would henceforth consider him not only as a base violator of public faith, but as a stranger to the honour and integrity becoming a gentleman. On receiving this message Francis immediately sent back the herald with a cartel of defiance, gave the emperor the lie in form, challenged him to single combat, and required him to appoint the time, place, and weapons. Charles accepted the challenge; but after many messages concerning the arrangements for the combat, accompanied with mutual reproaches bordering on the most indecent scurrility, all thoughts of the duel were given up. But this affair, though it thus terminated without any rencounter, is supposed to have had a great influence in producing an important change in manners all over Europe. Upon every insult or injury which seemed to touch his honour, a gentleman thought himself entitled to draw his sword, and to call on his adversary to give him satisfaction. Such an opinion becoming prevalent among men of fierce courage, of high spirit, and rude manners, where offence was often given and revenge always prompt, led to the sacrifice of many lives. The 'detestable practice of duelling, introduced,' as the Council of Trent says, 'at the instigation of the devil,' raged with the greatest violence in France, where it is calculated that 6000 persons fell in duels during ten years of the reign of Henry IV. His celebrated minister, Sully, remonstrated against the practice; but the king connived at it, supposing that it tended to maintain a military spirit among his people. But afterwards, in 1602, he issued a very severe decree against it, and declared it to be punishable with death; and at the same time commanded any person who had suffered wrong or received an insult to submit his case to the governor of the province, in order that it might be considered by a tribunal consisting of the constables and marshals of France. This decree, however, accompanied by the institution of a tribunal of honour, did not put an end to duels in France. New prohibitions were issued in 1609, 1611, 1613, 1623, 1624, and on numerous other occasions, but they were all powerless to stop the practice. Richelieu was firm in carrying out all edicts by which he hoped to check the power of the nobility, and accordingly insisted on the strict observance of those against duels. Under his ministry the Count of Bouteville-Montmorency suffered death in 1627 for having violated a decree of the French parliament against duelling. This had for a time the effect of deterring others from engaging in this practice. During the minority of Louis XIV. the law was more feebly administered, and more than 4000 nobles are said to have lost their lives in duels; but afterwards Louis XIV. showed as much severity in repressing them as Richelieu himself had done. The rage for duelling was reenkindled in the eighteenth century, in spite of a royal decree of 1723. With the revolution of 1789 commenced the period of legal impunity for duels, and a new class of duels became common, those, namely, between men engaged in politics. Bills, with a view to put down the practice, were brought forward in the chambers in 1829 and 1830, and a similar proposal was made to the Council of State in 1832; but they were not accepted. At last, in 1837, the Court of Cassation determined to follow a new law with regard to duels, and protesting against the practice in the name of morality and law, it decided that in case of death or injury resulting from a duel, the principal parties and the seconds should be proceeded against and punished in accordance with the general provisions of the *code pénal*. The French courts, however, reserve to themselves a discretionary power in dealing with cases of duelling, and the practice is not yet quite obsolete in France.

Single combats are said to have been introduced into England by the Normans. In the time of chivalry numerous single combats took place in England, which, in the proper sense of the term, can scarcely be called duels. It may be said that the duel, strictly so called, was introduced into England about the

same time that it became common in France, such was the contagion of the example of Francis I. and Charles V. In the reign of James I. of England there were numerous cases of duelling, the most celebrated of which is that in which Lord Bruce and Lord Sackville (afterwards Lord Dorset) were the principals, and in which the former was killed. The Cavaliers were extremely sensitive on the point of honour, as Sir Walter Scott shows in the admirable delineation which he furnishes us with in Woodstock of the ideas and manners which prevailed in that party. Cromwell was an enemy of the duel, and during the protectorate there was a cessation of the practice. It came again into vogue, however, after the Restoration, thanks chiefly to the French ideas that then inundated the court of St. James. Some of the duels of that epoch are in perfect accord with the loose morality then prevalent. An instance of this is the duel in which the Duke of Buckingham killed the Earl of Shrewsbury, while the wife of the latter, the cause of the duel, who had accompanied the duke to the ground, witnessed the encounter in the dress of a page. A striking thing is that as society became more polished in England, duels became more frequent. They were never more numerous than in the reign of George III. Among the principals in the fatal duels of this period were Charles James Fox, Sheridan, Pitt, Canning, Castlereagh, the Duke of York, the Duke of Richmond, and Lord Camelford. The last-mentioned was the most notorious duellist of his time, and was himself killed in a duel in 1804. Of all the duels which have taken place during the reigns of George IV., William IV., and Queen Victoria the most celebrated is that which was fought between the Duke of Wellington and Lord Winchelsea in 1829, the cause of which was certain animadversions which Lord Winchelsea had passed on the Duke's conduct in connection with the Catholic Emancipation Bill. The duel passed off without any injury being done to either of the parties engaged. The Duke of Wellington missed his aim, whereupon Lord Winchelsea fired into the air and apologized. The last duel which attracted some attention in England was that between the Earl of Cardigan and Captain Tuckett. Since that time, partly owing to the fact that public opinion has set itself strongly against duelling, and partly to the fact that this change of public opinion has led to a more rigorous enforcement of the laws against duellists, the practice may almost be said to have become extinct in England. Even in the army duelling is now rare, since the offence is now, according to the Articles of War promulgated in 1844, one for which any person concerned in it may be tried by court-martial and cashiered, or punished in any other way the court may think fit.

At one time duels were rather common at the German universities. They were seldom serious affairs. The swords of the parties were usually wrapped round with wisps of straw, only the points being left bare, and the combatants themselves were carefully padded all over the body except the face and sword-arm, which alone were left uncovered. The first scratch received by either combatant decided the duel, and the one who had thus been successful in first wounding his antagonist was declared the victor.

DUET, a musical composition for two voices or instruments.

DUFRESNE, or Du Fresne, Charles, Seigneur du Cange, hence often called *Ducange*, a man of letters, who did much for the history of the middle ages, especially as regards his own country, as well as for the Byzantine history. He was born in 1610, at a farm near Amiens, of a respectable family, and studied in the Jesuits' College at that place, afterwards at Orleans and Paris. At this last place he became parliamentary advocate in 1631, and in 1645 royal treasurer at Amiens, from which place he was driven by a pestilence, in 1668, to Paris. Here he devoted himself entirely to literature, and published his great works, viz. his Glossaries of the Greek and Latin peculiar to the Middle Ages and the Moderns; his Historia Byzantina (Paris, 1680, fol.); the Annals of Zonaras; the Numismatics of the Middle Ages; and other important works. He died in 1688.

DUFRESNY, Charles Rivière, a French comic poet, born at Paris in 1648; died in 1724. Being a man of talent, and passing for a great-grandson of Henry IV. of France and *la belle jardinière d'Auet*, he was well received by Louis XIV., who made him his valet de chambre. He was afterwards appointed manager of the royal gardens, on account of the strong love of flowers which he manifested, and in this capacity he introduced into France the taste for gardens in the English style. He received various other gifts from the king and the regent, but they did not suffice to meet his extravagance, and he died in reduced circumstances. Among his dramatic pieces may be mentioned L'Esprit de Contradiction, a one-act play in prose; Le Mariage fait et rompu, written in verse; and a second prose piece in three acts, called Le Double Veuvage. He is also the author of a romance in which he depicts the manners of the time after the fashion of Le Sage. It is called Les Amusements sérieux et comiques. His complete works were published in six vols. in 1731. Selections from his works were published by Auger in two vols. in 1810.

DUGDALE, Sir William, an English antiquary, born in 1605, of a good family in Warwickshire, early devoted himself to the study of native antiquities, and formed an intimate acquaintance with other learned men engaged in the same pursuits, particularly the celebrated Henry Spelman, whose interest obtained for him the appointment of a pursuivant-at-arms. He was afterwards, in 1640, made rouge-croix pursuivant, and had apartments in the heralds' office, with ample opportunities for his favourite study. During the rebellion he accompanied Charles I. in his campaigns. He was some time in Oxford before it capitulated to the Parliament in 1646, immediately after which he repaired to London, and in concert with Dodsworth completed his collections out of the Tower records and the Cottonian Library. These formed an important part of the Monasticon Anglicanum (1655 to 1673), in which, however, Dodsworth had the principal share. The principal work of which Dugdale had the sole merit is the Antiquities of Warwickshire, published in 1656. At the Restoration he was appointed Norroy king-at-arms, and in 1677 Garter king-at-arms, with the honour of knighthood. He died in 1686, at the advanced age of eighty-one. Besides the works already mentioned, he published the Baronage or Peerage of England, in three vols. folio (1675–76); Origines Judiciales, or Historical Memoirs of the English Law, Courts of Justice, &c. (1666); a History of St. Paul's Cathedral (1658); and various minor writings. He also completed and published the second volume of Spelman's Concilia.

DUGONG (*Halicore*), a genus of Cetacea, characterized by an elongated body, a broad caudal fin of a crescent shape, thirty to thirty-two teeth, of which four above and six to eight below are incisors, and five on each side of both jaws are molars. It has no canines. Its skin is very thick, but without hair, though its upper lip is beset with strong bristles; and others are found more sparingly on different parts of its body. The only species known are the *Halicore Indicus* of Fr. Cuvier, and another, discovered in the

Red Sea by Rüppell, and called *Halicore tabernaculi*. The latter is perhaps only a variety of the former, which, as its name implies, belongs to the Indian Archipelago. It frequents shallow shores covered with the marine plants on which it feeds, and lives in herds, which defend themselves mutually, and often attack small fishing vessels. The Malays consider the flesh as delicious. Their numbers have already been much thinned by fisheries, and there is reason to apprehend that in the course of a few years the race will become extinct.

DUGUAY-TROUIN, René, a distinguished French seaman, was the son of a rich merchant and skilful navigator, and born at St. Malo in 1673. He made his first voyage in 1689 in a vessel of eighteen guns which his family fitted out in the war against England and Holland. His courage induced his family to trust him with a ship of fourteen guns. Being driven on the coast of Ireland he burned two ships and took a fort in spite of the opposition of a numerous garrison He was once taken prisoner, and carried into Plymouth. He there gained the love of an English female, who procured him his liberty. He once more made a cruise on the coast of England and took two ships of war. Duguay-Trouin, now in his twenty-first year, attracted the attention of the government. Louis XIV. sent him a sword. He captured great numbers of English and Dutch ships on the coast of Spain and Ireland; in 1696 he took a great part of the outward-bound Dutch fleet under Wassenaer; in 1697 he entered the royal marine as a captain. He signalized himself so much in the Spanish war that the king granted him letters of nobility, in which it was stated that he had captured more than 300 merchant ships and twenty ships of war. By the capture of Rio de Janeiro (1711) he brought the crown more than 25,000,000 francs. Under Louis XV. he rendered important services in the Levant and the Mediterranean. He died at Paris, 1736. His memoirs appeared there in 1740 in four vols. His Éloge was written by Thomas.

DU GUESCLIN, Bertrand, Constable of France, renowned for his talent and courage, was born about the year 1314 at the castle of Motte-Broon, near Rennes. According to the descriptions which remain of him he was of a vigorous frame, with broad shoulders and muscular arms. 'I am very ugly,' said he when a youth; 'I can never please the ladies; but I shall at least know how to make myself terrible to the enemies of my king.' At the age of seventeen he won the prize at a tournament at Rennes, where he had gone against the will and without the knowledge of his father. From this time he was always in arms. After the disastrous battle of Poitiers in 1356 he came, while King John was yet a prisoner, to give assistance to his eldest son, Charles, who then held the regency. Melun surrendered; those of his party obtained their freedom, and many other towns yielded to him. Charles V., who in 1364 had succeeded his father, rewarded in a suitable manner the services of Du Guesclin, who in the same year gained a victory at Cocherel over the forces of the King of Navarre, commanded by Captal de Buch. But at the end of the war in Brittany he was obliged to surrender himself to Chandos at D'Auray. After being liberated on ransom he gave his support to Henry of Transtamara, who had assumed the title of the King of Castile against his half-brother, Peter the Cruel. He succeeded in establishing Henry on the throne of Castile, but Peter the Cruel then summoned the Black Prince and Chandos to his aid, and a check was thus put to the victorious career of Du Guesclin. He was defeated and taken prisoner at Navarete in 1367, but was soon ransomed, and by the victory of Montiel re-established Henry on the throne in 1369. In 1370 Du Guesclin was made Constable of France, and soon after returned to his native country to defend it against the English. The latter, hitherto victorious, were now everywhere beaten. They were deprived of all the territories they possessed in France, retaining only a few of the chief towns on the coast. He died in the midst of his triumphs before Châteauneuf-de-Randon, July 13, 1380.

DUISBURG, a town in Rhenish Prussia, on the railway from Cologne to Hanover, between the Ruhr and the Augerbach, 15 miles north of Düsseldorf; pop. in 1871, 30,520. It is an ancient place, believed to be of Roman origin, early rose to be a free town, and became a member of the Hanseatic league. It was early fortified, suffered much from repeated sieges, and is still surrounded by dilapidated walls flanked with towers. It possesses a beautiful church of the fifteenth century, and a gymnasium substituted for its university, which was suppressed in 1802. Its manufactures, chiefly of woollens and cotton prints, are extensive; and its trade, chiefly in wine and colonial produce, is greatly facilitated both by the railway and by a canal communicating with the Rhine, which is about 2 miles distant.

DUJARDIN, Karel, a Dutch artist, who excelled in painting landscapes, animals, and scenes in low life, was born in 1640 at Amsterdam. He went to Italy when young, and was a member of the Society of Painters at Rome, among whom he was called *Barba di Becco*. His works met with general approbation. On his way home to his native country he contracted considerable debts at Lyons, to free himself from which he married his old and rich landlady. He went with her to Amsterdam, where his pictures were valued very highly. He soon secretly left his home in that city, probably from dislike to his wife, and went to Rome, where he was welcomed by his old friends and admirers, and lived at great expense. Thence he went to Venice, where he died, in 1678, in the prime of his life. His landscapes have spirit and harmony, his figures expression, and his colour the brilliancy which distinguishes his school. His paintings are rare, and command a high price. He also published fifty-two landscapes etched with much spirit and ease.

DUKE (in French *duc*, in Spanish *duque*, in Italian *duca*, all derived from the Latin *dux*, leader, commander), a title belonging originally to a military leader. Gibbon says the title came into use when Constantine separated the military and civil commands of the provinces; the title *dux* was then applied to the military governor of a province, and for a time the ducal rank was considered inferior to that of the *comes* (count). The Goths, Franks, and other northern tribes who invaded the vast Roman territories, adopted, if they had not before borrowed, the titles of duke and count. Among those warlike peoples, however, the dukes, as military chiefs, soon acquired a marked pre-eminence over the counts, whose functions in the Eastern and Western Empires were more of a civil and judicial nature. Under Charlemagne, who was jealous of the increasing power of the higher nobility, the dignity was suffered to cease, but under his weaker successors the ducal governors of the provinces attained an almost absolute independence. The concession of hereditary power and independent jurisdiction, first to the central province known as the Isle de France, and then to Aquitaine, extended itself under the Carlovingians to Burgundy, Normandy, and Gascony, and on the accession of Hugh Capet to all the other subaltern tenures. It was not long until the dukes, feeling secure in the unlimited governing power of their provinces, proclaimed their title to be as good as that of the king. They coined money, assumed the crown and sceptre, gave law to their subjects,

made war even against the king, and reduced the royal jurisdiction to a few towns such as Rheims and Laon. Under the Capetiens, however, these duchies were gradually reunited to the crown, and those subsequently accorded to the members of the royal family enjoyed none of the privileges of independent sovereignty. Prior to the revolution dukes were created by letters patent of the king, and were of three kinds, and those designated as dukes and peers held the first rank and had a seat in parliament. The dignity of the second class descended to their male children, but that of the dukes by brevet ceased with themselves. The rank of duke in the royal family of France was superior to that of prince, and sometimes inferior to that of count. The ducal, along with all other titles of nobility, was abolished at the revolution, but was restored by Napoleon in 1806. In Germany the dukedom passed through phases similar to that exhibited in France. In 847 the Emperor Louis appointed a duke (*Herzog*) of Thuringia to protect the frontiers against the Wendes, or Vandals, a Slavonic tribe. The power of the dukes gradually increased, their dignity became hereditary, and they soon became powerful members of the German Empire. An Archbishop of Cologne, Bruno, was the first who bore (in 959) the title of archduke (*Erz-herzog*), which since the time of the Emperor Frederick III. (1453) has been given exclusively to the princes of the house of Austria. All the Austrian princes are archdukes. Napoleon conferred the arch-ducal dignity on several German princes, which the Congress of Vienna confirmed to them. In England dukes are the highest in rank among the nobles. The first hereditary duke in this country was the Black Prince, created by his father, Edward III., in 1336. The duchy of Cornwall was bestowed upon him, and was thenceforward attached to the eldest son of the king, who is considered *dux natus*. The duchy of Lancaster was soon after conferred on his third son, John of Gaunt, and hence arose the special privileges which these two duchies still in part retain. In the reign of Elizabeth, in 1572, the ducal order was extinct, and not revived till the creation of Villiers, duke of Buckingham, and Ludovic Stuart, duke of Richmond, by James I. There are fully thirty dukes on the British peerage rolls, including those of the blood-royal. The coronet of a British duke consists of eight strawberry leaves on a rim of gold. In the Bible the word *dukes* is used, Gen. xxxvi. 15, for the *duces* of the Vulgate.

DUKE OF EXETER'S DAUGHTER, a rack in the Tower of London, so called after its inventor, a minister of Henry VI. According to Blackstone it was never put in use.

DUKINFIELD, or DUCKINFIELD, a town and township, England, county Chester, separated by the Tame from Ashton-under-Lyne, of which it may be considered a suburb; a station on the Manchester, Sheffield, and Lincolnshire Railway. It has several churches, and chapels belonging to various bodies of Dissenters. Extensive collieries, cotton factories, brick and tile works, give employment to the greater part of the population, which until recently has been rapidly increasing during the last half century. Pop. 26,329.

DULCAMARIN. The *Solanum dulcamara*, bitter-sweet, or woody nightshade (see NIGHTSHADE), an indigenous plant, is used in medicine. The young twigs dried, bruised, treated with water, and strained, give an infusion which is used externally in skin diseases, and internally as a sudorific and alterative. The plant has been analysed, but the results do not quite agree. It contains, according to one chemist, a substance called by him dulcamarin, which is separated from the aqueous extract with some trouble, and forms a yellow transparent, resinous, easily powdered mass, readily soluble in alcohol, but sparingly so in ether, and very slightly soluble in water. It has a slight alkaline reaction, and gives a platinum salt. By a different process a body can be separated which has some of the properties of an alkaloid, but is almost inert physiologically. Solanin (which see) has also been obtained from bitter-sweet.

DULCIGNO, a small seaport town, European Turkey, Albania, on the Adriatic; lat. 41° 53′ N.; lon. 19° 11′ E. It is built on an isolated hill forming a cape, which is united to the low land by an isthmus; it contains about 8000 inhabitants, and is the seat of a Roman Catholic bishop. The inhabitants, formerly notorious under the name of *Dulcignottes*, as the most dangerous pirates of the Adriatic, are now engaged in commerce or in the fisheries of the river Bojana, 6 or 7 miles south-east from the town.

DULCIMER, a musical instrument resembling, if not identical with, the psaltery or *nebel* of the Jews. The modern dulcimer consists of a small square, triangular, or trapeziform box about 4 feet long, containing the sounding-board, at the right and left of which are the screws for tuning. The strings are of wire, and there are two or three in unison for each tone. The compass embraces about three octaves. It is played with two little sticks having oval knobs at each end. When played *forte* the sound is too confused to be pleasant, as there is no contrivance to stop the vibration of the strings, such as the dampers of the pianoforte. The instrument is now seldom met with except in the hands of street musicians.

DULCITE ($C_6H_{14}O_6$) is identical in composition with mannite, but differs from it in properties and in derivatives. It was obtained by Laurent in 1850 from an unknown sugary substance from Madagascar, which was in rounded lumps, but crystalline when broken through. By dissolving in water, filtering from impurities, and evaporating, the dulcite was deposited in large transparent, lustrous, modified monoclinic prisms. It was afterwards identified with a substance, melampyrite, obtained in 1836 by making a watery decoction of *Melampyrum nemorosum*, adding milk of lime, concentrating, neutralizing with hydrochloric acid, and allowing the crystals to form in the cold fluid. Dulcite has a specific gravity of 1·46. It has a slightly sweet taste, no odour, and no rotatory effect on light. It is soluble in water, very sparingly soluble in alcohol. It fuses about 360° F.; at a higher temperature it loses water and yields *dulcitan*—a syrup soluble in absolute alcohol, reconverted into dulcite by long action of water, and combining with stearic, benzoic, butyric, and some other acids, to form compound ethers called *dulcitanides*—and at a still higher temperature is decomposed, giving off gases and a distillate with an acetous odour. Nitric acid converts it into mucic acid, not into saccharic acid; the fuming acid into a nitro-compound; strong sulphuric acid into dulcisulphuric acid. It does not ferment with yeast. Dulcite combines with metallic oxides; the compounds with the alkalies and alkaline earths are crystalline and soluble in water, and to some extent also in alcohol.

DULSE, the Scotch name applied to various species of reddish brown or rose-coloured *Algæ* (*Rhodomenia palmata*, *Iridæa edulis*, &c.) It is consumed in considerable quantities throughout the northern countries of Europe and in the Grecian Archipelago. The pepper-dulse (*Laurentia pinnatifida*), distinguished for its pungent taste, and the young stalks of the sea tangle, were of old often eaten in Scotland, and the itinerant vendors of these wares still find numerous purchasers. When stripped of the thin part, the beautiful tangle, called in Scotland *badderlocks* (*Alaria esculenta*), forms a part of the simple fare of the poorer classes of Scotland, Ireland, Iceland, Denmark, and the Färöes.

DULWICH, a village, England, county Surrey, 5 miles south of London, in a small vale surrounded by rising grounds, and surrounded with handsome villas. It is noticeable chiefly on account of its college and schools, the former called the College of God's Gift, founded in 1619 by Edward Allen or Alleyn, a distinguished actor in the reigns of Elizabeth and James I. The building consists of three sides of a quadrangle, and has attached a manor of 1400 acres. The members of the college are a master, warden, four fellows, six poor brethren, six sisters, twelve scholars, and thirty out-members. The original revenues were only £800, but now amount to £14,000. The Dulwich College schools, consisting of three handsome blocks of building, stand apart from the college proper. They have accommodation for 700 pupils. The sons of inhabitants of Dulwich are entitled to gratuitous instruction; and certain sums, under the discretion of the master and wardens, are appropriated as exhibitions to either Oxford or Cambridge. Dulwich College is celebrated for its pictures, many of which were bequeathed by the founder; but the greater and more valuable portion of them were the bequest of Sir Francis Bourgeois, a landscape-painter of some eminence, who died in 1810; he bequeathed also £2000 for the purpose of building a gallery for the reception and proper care of the pictures. The collection includes paintings by Teniers, Wouvermans, Cuyp, Claude, Paul Potter, Ruysdael, Vandyke, Rubens, Rembrandt, Poussin, Salvator Rosa, Caravaggio, Paul Veronese, Guido, Titian, and other great masters. A free-school was founded in Dulwich, in 1741, by James Alleyne, a master of the college, for sixty boys and sixty girls, of which number twelve of the former and twenty of the latter are clothed by subscription. Pop. 4041.

DUMARSAIS, Cesar Chesneau, a philologist, was born in 1676, at Marseilles. He early lost his father, his fortune was dissipated by the extravagance of his mother, and a library which he inherited was sold. The idea of losing the latter so disturbed the boy, then but seven years old, that he concealed all the books of which he could possess himself. He became an advocate, married unhappily, kept a school, and died in misery, 1756. His merits were overlooked by his own age, and his best works remained for a long time unknown. D'Alembert aptly calls him the La Fontaine of philosophers. De Gerando, in a prize dissertation presented to the French Institute in 1805, has justly appreciated the merit of this profound inquirer. His works were published at Paris, 1797, in seven volumes. The principal are, A New Method of Teaching the Latin Language; a Treatise on Tropes; the Principles of (general) Grammar; and his contributions to the Encyclopedia.

DUMAS, Alexandre, one of the most popular and prolific of modern French dramatists and novelists, was born at Villers-Cotterets, 24th July, 1803. He was the son of a republican general who bore the same name, and grandson of Marquis de la Pailleterie and a negress, Tiennette Dumas. In 1807, on the death of his father, who left his family unprovided for, he was left in charge of his mother, who let him have pretty much of his own way. The consequence was that he picked up little education at school, and when he went to Paris at the age of twenty, to push his fortune, his beautiful handwriting was the only recommendation which General Foy, a friend of his father, could offer in his favour in introducing him to the notice of the Duke of Orleans. This nobleman (afterwards Louis Philippe) employed him as an assistant-secretary at 1200 francs a year. He now devoted his leisure hours to completing his education, and his ambition ceaselessly prompted him to shine in the field of literature. Some of his lighter dramatic works were rejected by the theatrical directors, some were accepted, and had more or less success, bringing but little fame or profit to their author. At last (10th Feb. 1829) his drama of Henri III. appeared on the stage of the Comédie-Française. The third tier of the theatre was filled by the good-natured Duke of Orleans and his brilliant circle of friends, who led the applause. It was produced when the battle between the Romanticists and the Classicists was at its height, and hailed as a triumph by the former school. The piece became popular and brought the lucky dramatist the sum of 30,000 francs, and the post of librarian to the Duke of Orleans. The same year appeared his Christine, and in quick succession, Antony, Richard d'Arlington, Térésa, Le Tour de Nesle, Catherine Howard, Mlle. de Belle-Isle, &c. Dumas had now become a noted Parisian character. The critics fought over the merits of his pieces, and the scandalmongers over his prodigality and *galanteries*. Turning his attention to romance, and desirous of becoming the Walter Scott of his country, he produced a series of historical romances, among which may be mentioned, Les Deux Dianes; La Reine Margot; Les trois Mousquetaires, which, with its continuations, occupies eight volumes. The Comte de Monte-Cristo and the Memoires d'un Médicin, and one or two others, are also well known through translations to English readers. Several historical works also bear his name: Louis XIV. et son Siècle; Le Regent et Louis XV.; Le Drame de '93; Florence et les Médicis, &c. In 1852 he began the publication of his Mémoires, a curious autobiography, which presents interesting sketches of literary life during the restoration, but which soon disgusts the reader by the intense egotism displayed all through the work. He tried to acquire political importance through the publication of a daily newspaper, La Liberté, which was a miserable failure; then followed a monthly magazine, Le Mois, which was not more successful; this again was followed by Le Mousquetaire, subsequently called Le Monte-Cristo, which lived a good number of years, and in which he published his romances, translations, Mémoires, Causeries, &c. In 1846 he accompanied the Duke of Montpensier to Spain as the historiographer of his marriage; and some time afterwards a small steamer was put at his disposal for a voyage to Africa. On his return to Paris he opened a theatre for the purpose of producing only his own pieces; and built a fantastic and costly country seat, which was known as the Château de Monte-Cristo, and on which he expended 450,000 francs. In 1853 his extravagances had so reduced his means that he was compelled to retire to Belgium. Speedily recovering from pecuniary embarrassment he visited Russia, the Caucasus, Greece, and Turkey. In 1860 he accompanied Garibaldi in the expedition which freed Naples from the Bourbons, and contributed not a little, if we can take his own word for it, to the great liberator's success. He died at the residence of his son, at Puits, near Dieppe, on the 5th December, 1870.

It is difficult to come to a satisfactory conclusion as to the merits of this author. Some of his productions are little else than mere translations from English and German sources. His first drama, Henri III., is but a skilful piece of patchwork, Walter Scott and Schiller furnishing him with the bulk of the material. Equally fatal to his reputation is our knowledge of the fact, gained from a lawsuit he had with the Presse and the Constitutionnel newspapers, and from a work by Mirecourt, entitled, Fabrique de Romans, Maison A. Dumas et Cie. (Dumas & Co.'s Romance Factory), that he had arranged to supply those journals during the year with more novels than the most expert scribe could copy in the time, and that he had

in his pay numerous hacks who did the serious part of the work. The only claim he could lay to a great number of the productions issued under his name, was that he either sketched the plot or revised them before going to press. Yet of the talent and even genius of Dumas there can be no reasonable doubt; he had great fertility of invention, much humour and gaiety, and genuine dramatic power, as the works that were undoubtedly from his pen sufficiently testify; and it was not till he had secured a front rank in literature by his own exertions that he descended to the unworthy plan of employing assistants to manufacture novels to order. A number of his collaborateurs, such as Feuillet, De Nerval, Souvestre, and Meurice, have subsequently gained a good position in French contemporary literature.

The son of the subject of this article, ALEXANDRE DUMAS, FILS, is one of the cleverest, and not most moral of our present day novelists and dramatists. The notorious novel, La Dame aux Camélias, afterwards dramatized by himself, and on which Verdi's Traviata is founded, was his first successful essay. He has a peculiar liking for depicting scenes of the gay and dissolute Parisian life in rosy tints, and healthy English taste and morality have a peculiar disliking for such pictures.

DUMAS, MATTHIEU, born at Montpellier in 1753, early entered the French cavalry, and as adjutant to Rochambeau took part in the war of North American independence. After his return he obtained the rank of major, and was employed on several military missions in the Levant and in Holland. In 1788 he held an important appointment in the war office. At the commencement of the revolution he assisted Lafayette in organizing the national guard; in 1790, when Louis XVI. was brought back from Varennes to Paris, he was the superior officer in command; and in 1792 was appointed brigadier-general and commandant of Metz. As a member of the National Assembly he declared himself decidedly in favour of moderate measures, and thus made himself so obnoxious to the more violent demagogues that he was ultimately obliged to take refuge in Switzerland. Here he relieved the tedium of exile by commencing the historical work which was afterwards published, and gives him an honourable place among military writers. On the establishment of the directory he returned to France, and was elected by the department of Seine and Oise a member of the Council of Ancients, where he joined the party of Portalis, Dupont de Nemours, Carnot, and others. Most of the party ultimately perished in the tropical swamps to which they were transported; Dumas escaped almost by miracle, and found an asylum at Hamburg. Here he published the two first volumes of his Précis des Evénemens Militaires. He was recalled from exile by Napoleon, who had become first consul. His first employment was to organize the reserve for the army of Italy. In 1802 he was appointed state councillor, in which capacity he was employed in many important affairs, and took the lead in the tribunate and legislative body in the discussions relative to the creation of the Legion of Honour; in 1805 he became general of division, and was shortly afterwards Neapolitan minister in the service of Joseph Bonaparte, who made him grand-marshal of the palace. In 1808 he returned to France, was actively employed in the arrangements for the war against Austria, fought in the battles of Essling and Wagram, and arranged the terms of the armistice of Znaim. He held the office of general intendant of the army in the campaign of 1812, as well as in that of 1813, when he concluded the capitulation of Dresden. Prince Schwartzenberg, however, refused to ratify its terms, and Dumas, made prisoner, was carried off to Hungary. On his return in 1814, after the restoration, Louis XVIII. appointed him councillor of state, gave him several important appointments connected with the army, and in 1815 sent him to Metz, where his duty was to prevent the guard from going over to Napoleon. During the Hundred Days his only employment was in organizing the national guards. After the second restoration Dumas was first employed in the war department in 1818, and was again admitted to the council of state; but having joined the opposition in the chamber of deputies, was deprived of all his appointments. In 1830 he was one of the 221 deputies who signed the address which paved the way for the revolution of July. After the fall of Charles X. he once more, in concert with Lafayette, organized the national guard of Paris, and obtained the chief command of all the national guards of France, together with a peerage. Latterly he became almost blind, and died in 1837. His military work above referred to, embracing the ten years from the Congress of Rastadt in 1797 to the Peace of Tilsit in 1807, extends to nineteen vols., and is regarded as high authority. He also published a translation of Napier's History of the Peninsular War, with notes, and left behind him materials for a work which was published by his son under the title of Souvenirs de M. Dumas.

DUMBARTON (formerly *Lennox*, or *Levenix*), a maritime county, Scotland, consisting of two detached portions, the larger and most westerly having the county of Perth on the north, Loch Lomond and the county of Stirling on the east, the Clyde separating it from the county of Renfrew on the south, and Loch Long separating it from the county of Argyle on the west. Its utmost length is about 37 miles, breadth varying from 5 to 7 miles, and in some places, towards its northern extremity, diminishing to 1 and 1½ mile. The smaller portion is about 4 miles east from the former, and comprises the two parishes of Cumbernauld and Kirkintilloch. It is about 14 miles long, and from 1½ to 3½ miles broad, having the county of Stirling on the north and east, and the county of Lanark on the south and west. These two parishes formerly belonged to the county of Stirling, but were annexed to that of Dumbarton in the reign of Robert I. More than half the area of the county is occupied by lofty and rugged mountains, some of them attaining a height of upwards of 3000 feet above sea level. Though unfit for cultivation, and covered with snow for several months in the year, they abound in excellent pasture for sheep, and produce many rare alpine plants. The lower lands are fertile, and in general well cultivated. Next to its mountains, which contribute to the formation of some of the most magnificent scenery in Scotland, are, as regards picturesque beauty, its lakes, of which the principal is the far-famed Loch-Lomond, which separates it for about 24 miles from Stirlingshire. The most considerable of the other fresh-water lakes, of which there are nine or ten, is Loch Sloy. The Gareloch, an arm of the sea lying parallel to Loch Long, forms a part of the county into the Roseneath peninsula. The principal river is the Leven, which issues from Loch Lomond, and discharges itself into the Clyde a little below the town of Dumbarton. The state of agriculture in this county is as various as its soil and surface. The farms in general are small, except where the heath and mountains are used as sheep pasture. Wheat is now raised to a considerable extent, but oats are the principal grain crop. Turnips, beans, and potatoes are also grown, the last in large quantities and of superior quality. The climate is in general mild, but extremely moist, and is thus more favourable to pasturage and the growth of wood than to agriculture. There are extensive natural copse-

woods in the county, which add much to the beauty of the scenery, and large plantations of wood have been made during the last half century. The chief minerals are coal, limestone, ironstone, and slate, all of which are wrought more or less—the first two to a great extent, at Old Kilpatrick, Kirkintilloch, and Cumbernauld. On the banks of the Leven and elsewhere are several extensive cotton printing and bleaching establishments. Helensburgh and Loch Lomond are connected by railway with Glasgow, and another line runs from the loch to Stirling. The detached part of the county is traversed by the lines belonging to the North British and Caledonian Railway Companies, and by the Clyde and Forth Canal, which has its west termination at Bowling. Besides Dumbarton, the chief town, the county contains the towns of Helensburgh, Kirkintilloch, Cumbernauld, and the manufacturing villages of Alexandria, Renton, and Bonhill; and it is divided into twelve parishes. The county returns a member to the House of Commons. Pop. (1871), 58,839.

DUMBARTON, a royal and parliamentary burgh and seaport, Scotland, chief town of above county, on the left bank of the Leven, within a short distance of its junction with the Clyde, 13 miles W.N.W. Glasgow, on a branch of the North British Railway. It consists of one semicircular street, from which numerous lanes and alleys diverge. The houses on the line of the main street are in general well built, but in some of the subordinate streets and lanes there are houses antiquated and mean-looking; great improvements have, however, recently been carried out, and many new houses built. On the right bank of the river is the suburb of West Bridgend, united with the town by a good stone bridge of five arches. The chief public buildings are the burgh hall, built in 1866, and containing rooms for the academy, and the county buildings. There are a mechanics' institute and a public reading-room. Ship-building, both in wood and iron, but especially the latter, and on the composite principle, is the staple business of the town, there being in all five spacious yards for ship-building, employing about 3000 men; and a marine engine manufactory is also carried on, employing about 400 men. Besides these there are a brewery, two foundries, an extensive forge, and a manufactory of patent windlasses, engines, &c. The river Leven is navigable to Dumbarton quay, at high water, for vessels of considerable size; but the channel, though it has been much improved, is still somewhat obstructed by sandbanks. The shipping belonging to the port is inconsiderable.

A little to the south of the town is the famous rock and castle of Dumbarton, situated on a flat point of land at the confluence of the Leven with the Clyde, now accessible at all times by land, although formerly surrounded by water. The rock terminates at the summit in two points, and, being precipitous and entirely isolated, has a very striking appearance. It is 206 feet in height, and about 1 mile in circumference at the base. On the side facing the river, looking south, stands the house once occupied by the governor; and between the two summits are the various buildings of the fort, consisting of the barracks, armoury, &c., the latter containing about 1500 stands of arms, the former capable of accommodating 150 men. In the armoury is kept a double-handed sword which is said to have belonged to the Scottish patriot Wallace. A long flight of steps leads to the barracks, &c., which are accessible by no other route. At what period a castle was first erected on this singular rock does not appear, but it seems to have been a stronghold from the earliest times, and is known to have been so for at least 1000 years. It is a place of considerable historical interest. It was at different times in possession of Edward I. It came subsequently and successively into the possession of Baliol, Bruce, Queen Mary, Charles I., and Cromwell. It was from this castle that the unfortunate queen just named was conveyed to France while yet a child. In 1563 she visited this fortress with a numerous retinue on a progress to Argyleshire. Dumbarton Castle was the scene also of a singularly daring adventure. In May, 1571, it was taken by escalade, on a dark and stormy night, by Captain Thomas Crawford and a few soldiers, under circumstances demanding an extraordinary degree of intrepidity. This fortress is one of the four stipulated to be kept in repair by the articles of the Union. Dumbarton was known in ancient times by the name of Alcluyd, which, in the British language, signifies the rock on the Clyde. It unites with Port-Glasgow, Renfrew, Rutherglen, and Kilmarnock in sending a member to the House of Commons. Pop. in 1871, 11,414.

DUMDUM, a military village and extensive cantonment, Hindustan, province of Bengal, 6 miles E.N.E. Calcutta. It is the head-quarters of the Bengal artillery, and may be considered the Woolwich of India. All the young officers arriving from Europe, as well as the recruits, are practically trained here before being sent to their respective regiments. Close by is a large plain appropriated to artillery practice. There are here a church and free-school. The village is famous as being the scene of the first open manifestation of the Sepoys against the greased cartridges, which led to the mutiny of 1857.

DUMFRIES, a maritime county, Scotland, on the Solway Firth, having on the north and east the counties of Lanark, Peebles, Selkirk, and Roxburgh; on the west, Ayr and Kirkcudbright; on the south, the Solway Firth and part of Cumberland; length, north-west to south-east, 53 miles; breadth, between 32 miles and 33 miles; area, 1098 square miles, or 702,953 acres, of which about a third are under cultivation. The surface is irregular, but for the most part mountainous, especially in the north and north-west districts, where the hills attain a considerable elevation, some of them exceeding 2000 feet. Lofty mountains occur also at intervals throughout the whole length of the northern limit of the county, including Hartfell, the highest in the south of Scotland, 2790 feet in height, and Ettrick Pen, about 8 miles south-east of the former, 2220 feet. These parts of the county abound in the most romantic scenery. In the lower, or southern portions, there are some extensive morasses, one of which, called Lochar Moss, is from 10 to 13 miles long and from 2 to 3 miles broad. In these swamps large trunks of trees, marine shells, ancient canoes, and iron anchors have been found at great depths in the moss. Arable husbandry has greatly improved here during the last half century, as have also farm buildings of all descriptions. They are now mostly commodious and well arranged, built of stone and lime, and covered with slate. Oats, potatoes, and turnips are the most common products. The cultivation of the last has increased greatly of late years; they are generally consumed on the ground by sheep. The cattle are mostly of the Galloway breed, and are much in request for the English market. The sheep on the hill pastures are mostly Cheviots; on the lower and arable lands the Leicester prevails. Immense numbers of pigs are reared in the county, hams and bacon, both of excellent quality, being cured in large quantities for the Liverpool, London, and Newcastle markets. The farms in the lower districts vary from 100 to 400 acres, and in the higher from 500 to 5000 acres. The principal streams are the Nith, the Annan, and the Esk, all falling into the Solway Firth, which in fact receives

the whole of the drainage of the county. There are likewise a number of small lakes. The minerals most abundant are coal, lead, iron, antimony, and gypsum. Coal is worked at Canonbie and at Sanquhar, and lead mines at Wanlockhead and Leadhills. The Wanlock ore contains a considerable proportion of silver. Limestone and freestone abound in various parts of the county. Gold also has been found amongst the mountains; and in the time of James V. considerable quantities were obtained. There are no manufactures worth mentioning. The county contains forty-three parishes, and returns one member to the House of Commons. Its principal towns are Dumfries, Annan, Sanquhar, and Lochmaben, which unite with Kirkcudbright in sending a member to Parliament. Pop. in 1861, 75,878; in 1871, 74,794.

DUMFRIES, a river port, and parliamentary burgh, Scotland, capital of the above county, beautifully situated on the left bank of the Nith, about 6 miles from its junction with the Solway Firth, 64 miles S.W. of Edinburgh, a station on the Glasgow and South-western Railway. It is one of the handsomest towns in Scotland. The houses are chiefly built of red sandstone, and are generally remarkable for their elegance. On the opposite side of the river is an extensive suburb called Maxwelltown, which communicates with the town by an old and a handsome modern bridge. The public buildings comprise the trades' hall, county buildings, including the courthouses and county jail; the assembly-rooms, theatre, academy, the Crichton royal institution, or lunatic asylum; the Dumfries and Galloway royal infirmary, and the Dumfries savings-bank, in front of which is a statue of the Rev. Dr. Duncan, the originator of savings-banks. Near the centre of the town is the town-house, of which Inigo Jones built the mid-steeple, and in the centre of Queensberry Square there is a stately Doric column, erected to the memory of Charles, duke of Queensberry. The manufactures consist of hats, hosiery, woollens, leather, glue, beer, &c. The river Nith is navigable to the town for vessels of above 60 tons. The chief imports are coal, lime, iron, tallow, slate, hemp, bones, wine, and colonial produce; the exports are principally grain, fat cattle, sheep, pork, wool, hosiery, wood, grass seeds, freestone, &c. There are three stations lower down the Nith for vessels drawing too much water to come up to the town. The number of vessels belonging to the port is about 70, of over 7000 tons. Dumfries is of great antiquity, and has been the scene of some remarkable historical events; one of which was the slaughter of John Comyn by Robert Bruce, which occurred in the chapel of the Franciscan or Grayfriars' convent, that stood in the street called the Friars' Vennel, on February 10, 1306. In the burying-ground of St. Michael's, or the old church, are deposited the remains of the poet Burns, who died in Dumfries, and whose resting-place is marked by a handsome mausoleum, erected by subscription. Burns resided in Dumfries for some years preceding his death, and the street in which he lived, a very humble one, is now distinguished by his name. Dumfries unites with Annan, Sanquhar, Lochmaben, and Kirkcudbright, in sending a member to the House of Commons. Pop. 15,435.

DUMONT, PIERRE ETIENNE LOUIS, the friend and literary assistant of Mirabeau and Jeremy Bentham, was born at Geneva in 1759. He was destined to the ecclesiastical career, and was ordained a minister of the Protestant church in 1781. He attached himself to the democratic party in Geneva, and when the opposite party gained the ascendency, he went to St. Petersburg, in 1782, where he was appointed pastor of the French Reformed Church. His talents for the pulpit caused his acquaintance to be sought by the eminent men, Russians or strangers, who were at the court of Catharine II. He had remained there but eighteen months when Lord Lansdowne invited him to England, with the intention of employing him to finish the education of his son. It was in the house of this statesman that he formed intimate connections with Jeremy Bentham and Sir Samuel Romilly. The French revolution brought him to Paris in the year 1789. He was soon called to associate himself with the men who were selected, for their strength and intelligence, to direct the destinies of France. It is asserted that the famous address to the king, proposed by Mirabeau, July 9, 1789, to obtain the sending back of the troops, was composed by Dumont. They undertook together a journal, the Courier des Provinces, designed to develop and render popular the new doctrines; and, as was likely to happen in such a partnership, the most assiduous as well as the most important labour fell upon Dumont. As soon as scenes of violence and cruelty began to sully the cause of liberty, Dumont quitted Paris, and returned to England. When the details of the reign of terror reached him in England, he was overcome with grief, and remained for some years plunged in sadness. What contributed the most to draw him from this state of depression was his increased intimacy with Jeremy Bentham, whom he had known since 1788. The enthusiasm of Dumont for Bentham was kept up, without deviation or division, to the end of his life. He sometimes said of what he most admired in other philosophers, 'It is convincing; it is truth itself; it is almost Benthamic.'—It is well known that M. Dumont edited many of the works of this distinguished lawyer, after divesting the ideas of the uncouth garb in which the author had clothed them. (See BENTHAM.) Dumont has spoken of the manuscripts which his friend put into his hands as 'a first draft,' 'unfinished manuscripts,' 'not corrected,' 'fragments or simple notes.' This was pointing out but a small part of their imperfections, and so much was done by Dumont to some of these works that not only the arrangement and line of argumentation, but sometimes even the results were altered. Suppressing much, sometimes adding, always making more perfect, he finally produced a system which has powerfully excited thought and reflection all over Europe. When Geneva recovered her independence in 1814 M. Dumont hastened back to his country, where his attempts to introduce liberal principles into the constitution of this little state exposed him to much political persecution; but he succeeded, eventually, in affecting some important improvements. He afterwards laboured assiduously to introduce an improved penal code, and was a member of a committee, appointed in May, 1817, for this purpose. He was also active in getting up a penitentiary, for which he drew up a plan in 1824. He died at Milan, in September, 1829.

DUMONT D'URVILLE, JULES SEBASTIEN CÉSAR, a celebrated navigator, was born in 1790, at Condé-sur-Noireau, in the department of Calvados. After completing his studies at Caen he entered the French navy, in which he ultimately rose to be vice-admiral. In 1819–20 he sailed in the expedition under Gaultier Duparc to the coasts of the Archipelago and the Black Sea. In 1822 he sailed with Captain Duperrey in the corvette *La Coquille*, and made his first voyage round the world. On a second voyage in the *Astrolabe* (1826–29), and a third in the *Zelée*, in 1834, he held the command. He was twice wrecked on barbarian coasts, first on the Tonga Islands, and next in Torres' Straits, and on both occasions owed his escape to self-possession and skilful seamanship. In 1830 the government of July intrusted him with the ship which carried Charles X. from

Cherbourg to England. He afterwards rendered important service by his search for the remains of the ill-fated expedition of La Pérouse, the survey of long tracts of coast in New Zealand and New Guinea, the discovery of numerous islands and an antarctic continent, and the exploration of very dangerous and still imperfectly known tracts of navigation, as Torres' Straits, in Australia, and Cook's Straits, between the two large islands of New Zealand. To his contributions to geography he was indebted for his nomination to the office of president of the Paris Geographical Society. One fruit of his voyages was the Enumeratio Plantarum in Insulis Archipelagi et Littoribus Ponti Euxini (Paris, 1822). After his second circumnavigation, he published the Voyage de l'Astrolabe (ten vols. Paris, 1830–39), and Voyage Pittoresque autour du Monde (two vols. 1834). He had also the chief part in drawing up the new voyages of the *Astrolabe* and *Zelée*. His death was very tragical. After escaping all the dangers of the sea, he was burned alive, along with his wife and son, in the frightful accident which took place on the Paris and Versailles Railway, 8th May, 1842. Monuments have been erected to him in his native town, and in the cemetery of Montparnasse at Paris.

DUMOURIEZ, CHARLES FRANÇOIS DUPERRIER, a French general of great military talent, was born at Cambrai in 1739, of a noble family of Provence. He joined the army in Germany in 1757, and was appointed a commissary. He then served as a cornet in the regiment of Escars. The day before the battle of Clostercamp he was wounded and taken prisoner; in 1761 was made a captain; dismissed in 1763, and presented with the cross of St. Louis. He afterwards visited Corsica, Spain, and Portugal. The conquest of Corsica, which had been ceded to France by Genoa in 1768, being determined upon, Dumouriez went as quarter-master-general of the small army which was sent thither, and was afterwards made colonel. In 1770 the government gave him the commission to oppose the measures of the Russian court at the confederation of Bar. He took part in the campaign of 1771 against the Russians. In 1773 he was sent by the king on a mission to Sweden, but was arrested at Hamburg by D'Aiguillon, to whom the mission was not agreeable, and put in the Bastile. In 1788 he was appointed brigadier. In 1789 he published a pamphlet in favour of the principles then in vogue, but failed in obtaining, as he wished, the rank of general. He therefore returned to Cherbourg, where he was made commander of the national guard in that city, and governor of Lower Normandy. At the end of the year he again returned to the capital, where he became a member of the Jacobin club. About this time he was made field-marshal of the twelfth division of the army; but, being dissatisfied with a post where he had little opportunity to distinguish himself, he remained in the capital, and courted more than ever the Jacobin party. After leaving the ministry, in which he had been placed for some time, he was made lieutenant-general in the army of Luckner, on the northern frontiers, and was invested with the command of the army of the centre after the departure of Lafayette (Aug. 19). The Prussians, Austrians, and united emigrants, had then made themselves masters of Longwy and Verdun, and were advancing upon Champagne. He took his position at Grandpré, and occupied the five passes of the woody heights of Argonne; but when the pass of Croix aux Bois was forced by the Austrians, he retired to St. Ménehould, while Kellerman maintained his position at Valmy (September 20, 1792), and then opened a negotiation with the King of Prussia. In October he returned to Paris, and formed a plan with the executive council for the winter campaign. On his return to the army he issued a proclamation, calling upon the Belgians to rise against their sovereign, and, November 6, assaulted the Austrian camp at Jemappes. Notwithstanding their small numbers, the imperial troops did not yield till after a long and bloody battle. Dumouriez then took up his winter-quarters on the Meuse and the Roer. February 15 he opened the campaign with the bombardment of Maestricht, and from Breda and Clundert, both which places he had captured, he made his attack on Holland. The greatest part of his troops, however, whom he had scattered in winter-quarters, were in no condition to meet the Prince of Coburg. This general, March 1, assaulted the French outposts on the Roer, overcame them, and threatened Maestricht. Dumouriez now drew together his troops to the plains of Tirlemont, gave battle to the Austrians at Neerwinden, and was defeated. He met with another loss at Louvain, and found himself obliged to retreat.

These disasters were the signal for his downfal. On his arrival at the French frontiers four commissioners and the minister Beurnonville, who were sent to arrest him, were delivered by him into the hands of the Austrians. He then issued a proclamation, in which he promised the restoration of the constitutional monarchy, in the person of the heir to the crown, but was attacked by the Versailles volunteers, compelled to cross the Scheldt, and to flee to the Prince of Coburg (April 4, 1793). The convention set a price of 300,000 livres upon his head. At first he retired to Brussels, afterwards to Cologne. The elector refusing him a residence in Mergentheim, he went to Switzerland, and in July passed over to England, which, however, he was compelled to quit; he then roved through Switzerland and Germany, and after staying for a time near Hamburg, where he published his Memoirs, found a final refuge in England. There was no party, except that of the Mountain, for which this political Proteus did not declare himself, in some of the various pamphlets that he published during his exile. Shortly after the battle of Eylau he wrote his Jugement sur Bonaparte, adressé à la Nation Française et à l'Europe. During the Spanish and Portuguese war he was very active in communicating plans to the British government, and to the Spanish and Portuguese authorities. The British ministry granted him an annual pension of £1200. He died, March 14, 1823, at Turville Park, near Henley-upon-Thames, England, at the age of eighty-four.

DUN (*hill*), a word common to the Celtic or ancient Teutonic languages, from which comes the French word *dune* and the final syllable *dunum* in Latin, as *Augustodunum* (Autun). The same word is found in *Dunkirk* (church of the hills). In Low-German the word *Dune* is still used for sandy hills on the sea-shore. In several English names the syllable *dun*, or its modifications *dum* and *don*, is used in a sense corresponding to *hill*, or *downs*.

DÜNA, or WESTERN DVINA, a river of Russia, rises in the government Tver, about 15 miles W. of the source of the Volga, flows first circuitously, S.S.W., through that government, and along the frontiers of the governments of Pskov, Smolensk, and Vitebsk, till it reaches the town of Vitebsk, when it turns gradually round, assumes a W.N.W. direction, separating Vitebsk and Livonia, on its right, from Minsk and Courland on its left, and finally falls into the gulf, about 10 miles below the town of Riga, after a course of about 650 miles. In spring it is navigable nearly to its source, but at other times not beyond Wilia. It continues frozen from the end of November to the beginning of April, and has several rapids, which become dangerous when the

water is low. It is connected with the Volga and the Dnieper by means of canals. It is subject to inundations, particularly at the melting of the ice, and frequently commits great ravages. It abounds with fish.

DÜNABURG, or DVINABURG, a fortified town, Russia, government of Vitebsk, on the right bank of the Düna, or Dvina, 112 miles south-east from Riga. It was formerly the capital of Polish Livonia, and has two Roman Catholic churches, a synagogue, and a convent. It carries on a considerable trade, and has three yearly fairs. Pop. 29,613.

DUNBAR, a royal parliamentary and municipal burgh and sea-port town in Haddingtonshire, situated on a gentle acclivity at the mouth of the Frith of Forth, 27 miles east of Edinburgh. It consists, chiefly, of one principal street running east and west, with some smaller streets and a number of lanes. It is a place of great antiquity, and originated in a castle, once of great strength and importance as a bulwark against the invasions of the English. The castle underwent several memorable sieges, the most memorable of which was that by the Earl of Salisbury, when it was successfully defended for nineteen weeks by Black Agnes, countess of Dunbar. The castle was destroyed by order of Parliament in 1567. In 1650 Cromwell, at the Race of Dunbar, defeated the Scottish army under Leslie. The harbour and quay of Dunbar are rather incommodious, and the usual depth of water is scarcely sufficient to float vessels of 300 tons burden. With the exception of some trade in corn, almost the only traffic carried on by sea here is connected with the catching, curing, and selling of fish, particularly herring. In the town there are a soap-work, breweries, an iron-foundry, and a steam-engine manufactory. Ship-building is also carried on to some extent. The town unites with North Berwick, Jedburgh, Haddington, and Lauder, in sending a member to the House of Commons. Pop. 3311.

DUNBAR, WILLIAM, the most eminent of all the old Scottish poets, was born, probably in East Lothian, about the middle of the fifteenth century. In 1475 he went to St. Andrews, where, in 1477, he took the degree of B.A., and two years later that of M.A. After this time he seems to have become a travelling noviciate of the Franciscan order, travelling in England and France, but he returned to Scotland in 1490, and attached himself to the court of James IV., from whom he received a small pension. It has also been inferred from several allusions in his poems that he had passed some considerable time on the Continent in the king's service, probably as 'clerke' or secretary to some of the Scottish ambassadors. On the marriage of James IV. to Margaret of England, Dunbar celebrated that event, so auspicious of the happiness of his country, in a poem of singular beauty, entitled, The Thrissil and the Rois, in which he emblematized the junction and amity of the two portions of Britain. He seems to have afterwards been on good terms with the queen, for he addresses several poems in a very familiar style to her majesty. Notwithstanding, however, his great merit as a poet, he seems to have lived a life of poverty, with perhaps no regular means of subsistence but his pension. He appears to have addressed both the king and the queen for a benefice, but always without success. How it came to pass that King James, who was so kind a patron to men possessing powers of amusement, neglected to provide for Dunbar, is not to be accounted for. Next to the Thrissil and the Rois, the most considerable poem by Dunbar was the Goldyn Targe, a moral allegorical piece, intended to demonstrate the general ascendency of love over reason: the golden targe, or shield of reason, he shows to be an insufficient protection to the shafts of Cupid. He is also supposed to be the author of an exquisitely humorous tale, entitled, The Freiris of Berwick, which has supplied the groundwork of a well-known poem of Allan Ramsay, designated The Monk and the Miller's Wife. Another composition, styled the Twa Maryit Wemen and the Wedo, contains much humorous sentiment and many sarcastic reflections upon the fair sex. The poem entitled A Dance, presents pictures of the seven deadly sins, equally expressive, perhaps, with any that could have been delineated by Milton himself. The date of his death is uncertain. It is supposed to have occurred between 1520 and 1530. He had the fortune, rare in that age, of seeing some of his works printed in his own lifetime. In 1508, among the very first efforts of the Scottish press, Chepman and Myllar published his Goldyn Targe, his Twa Maryit Wemen and the Wedo, and several other poems. The remainder of his compositions have only reached us through the medium of the Bannatyne and Maitland manuscripts. An edition of his poems, with a copious life and notes, was published by Mr. David Laing, of Edinburgh, in 1834.

DUNBLANE, or DUMBLANE, a market town and old episcopal city, Scotland, in the county of Perth, 6 miles north-east of Stirling, on the Allan, and a station on the Caledonian Railway. The most remarkable object is an ancient cathedral, partly in ruins, with a tower, situated on an eminence overlooking the town. The date of its erection is uncertain, but is supposed to have been in the twelfth century. The nave is 130 feet by 58 feet, and the choir, now the parish church, is 80 feet by 30 feet. Bishop Leighton, who held the see of Dunblane from 1662 to 1670, bequeathed his library to the clergy of the diocese, his executors providing at their own expense a suitable building for its reception, and endowing the establishment with funds to defray the librarian's salary, uphold the fabric, and add to the books. The public have access to the library, which has received large accessions from various quarters. About two miles from the town the indecisive battle of Sherriffmuir was fought in 1715, between the royal forces under the Duke of Argyle and the Jacobites under the Earl of Mar. Pop. 1709.

DUNCAN, ADAM, VISCOUNT, a naval officer of distinguished skill and courage, was born in Dundee, in 1731. He went to sea when young, obtained a lieutenancy in 1755, was made master and commander in 1759, and was a post-captain in 1761. In that station he served, in the following year, at the taking of Havana; and in 1779 he shared in the victory of Admiral Rodney over the Spaniards. In 1789 he was promoted to the rank of rear-admiral of the blue; and by regular gradation, in 1794 he became vice-admiral of the white squadron. The following year he was appointed commander of the North Sea fleet; when, after a tedious and harassing service of two years, occupied in watching the motions of the Dutch in the harbour of the Texel, Admiral Duncan found himself obliged to leave his station and sail to Yarmouth Roads, in consequence of the mutinous disposition of his sailors. The Dutch fleet put to sea, which was no sooner made known to Admiral Duncan's men than they returned to their duty, and he immediately sailed in pursuit of the enemy, came up with them near Camperdown, defeated them, and captured the commander, Admiral De Winter, and eight of his ships, 11th Oct. 1797. The conqueror was rewarded with the title of Viscount Duncan and a pension of £2000 a year. He died August 4, 1804.

DUNCAN, DANIEL, the son and grandson of physicians, and of Scotch extraction, was born at Montauban in 1649. He first pursued his philosophical studies at Toulouse, where he had Bayle for

a contemporary, then medicine at Montpellier, and after graduating visited Paris. He afterwards succeeded to his father's practice, but in consequence of the revocation of the edict of Nantes he had to leave France. He took up his abode at Geneva, but the jealousy of the physicians compelled him to quit it for Berne, whence he was driven as a French refugee. He proceeded to Berlin, where he was most warmly received, and was appointed professor of medicine. He afterwards went to the Hague, but in a few years went to London, where he occupied a prominent position as a physician for twenty-eight years, and at last died in London, April 30, 1735. He was the author of several works on the chemical and physical explanations of vital phenomena. He also wrote against the use of tea, coffee, and chocolate.

DUNCAN, THOMAS, an eminent Scottish painter, was born at Kinclaven, Perthshire, on 24th May, 1807. He was originally destined for the law, but abandoned its study for that of art under Sir William Allan. He early acquired considerable reputation by his delineations of the human figure, and was soon well known in Scotland as a rising artist. The first picture which extended his fame beyond the Tweed, and procured his admission as an associate of the Royal Academy, was Prince Charles Edward and the Highlanders entering Edinburgh after the Battle of Prestonpans. Another famous picture of his is Charles Edward asleep after Culloden, protected by Flora Macdonald. About his last work was the Martyrdom of John Brown of Priesthill, now in the Corporation Gallery of Glasgow. He died at Edinburgh on 25th May, 1845.

DUNCANSBY HEAD, a picturesque promontory, north-east coast of Scotland, in the county of Caithness, at the east entrance into the Pentland Firth; lat. 58° 39′ N.; lon. 3° 1′ W. It consists of a circular rocky eminence of about 2 miles in circumference, and is indented by several large ravines and remarkable fissures. Close by the promontory are two singular insulated rocks, of fantastic form and great height, called the Stacks of Duncansby, which in spring and summer are covered with sea-fowl. About 1½ mile west of the promontory stood the celebrated John O'Groat's House, of which no trace now remains.

DUNDALK, a maritime town and parliamentary borough, Ireland, capital of the county of Louth, on Castletown River, where it suddenly expands to half a mile in width, about 2 miles above its mouth in Dundalk Bay. It is an ancient place, and in a battle fought in its vicinity Edward Bruce, the brother of King Robert Bruce of Scotland, was slain. It is tolerably well built, and contains among its edifices a beautiful Roman Catholic church, a handsome court-house with a Doric portico, a guild-hall, cavalry barracks, and a nunnery. Its principal manufactures are pins, ropes, starch, and castings; and the trade, chiefly in agricultural produce, is very extensive. Pop. 10,893.

DUNDAS OF ARNISTON, the name of a family which held a conspicuous place in the legal and political history of Scotland for a period extending almost to a century and a half.—SIR JAMES DUNDAS, the first of Arniston, who was knighted by James VI. and who was made governor of Berwick, was the third son of George Dundas of Dundas, a descendant of the Dunbars, earls of March.—His eldest son, SIR JAMES, was knighted by Charles I., was member of Parliament for Mid-Lothian, and was appointed one of the judges of the Court of Session (1662). He was soon after deprived of this appointment for refusing to abjure the solemn league and covenant, and retired to his family seat at Arniston, where he died in 1679.—His eldest son ROBERT was also raised to the bench of the Court of Session by William III., and filled that station with great honour and integrity for thirty-seven years. He died in 1727.—His eldest son ROBERT was born in 1685, became a member of the faculty of advocates in 1709, and in 1717, while the country was recovering from the confusion consequent upon the rebellion of 1715, he was selected to fill the responsible office of solicitor-general for Scotland. In 1720 he was made lord-advocate; and in 1722 was returned member to the British Parliament for the county of Edinburgh. When Sir R. Walpole and the Argyle party came into power, in 1725, he resigned his office, and soon after was elected dean of the faculty of advocates. In 1737 he was raised to the bench, taking, like his father and grandfather, the title Lord Arniston. On the death of Lord-president Forbes of Culloden, in 1748, he was appointed his successor. He died in 1753.—His eldest son, ROBERT, was born in 1713, studied at Edinburgh and Utrecht, and spent his vacations in visiting Paris and several of the principal towns in France and the Low Countries. He returned to Scotland in 1737, was made a member of the faculty of advocates, and at the early age of twenty-nine became solicitor-general for Scotland. In 1754 he was member for the county of Edinburgh, and the following year was appointed lord-advocate for Scotland. In 1760 he was lord-president of the Court of Session, a situation which he held until his death in Edinburgh in 1787.

DUNDAS, HENRY, VISCOUNT MELVILLE, a distinguished statesman, was born in 1741, studied at the University of Edinburgh, and in 1763 was admitted a member of the faculty of advocates. He obtained the post of solicitor-general in 1773, that of lord-advocate in 1775, and was made joint keeper of the signet for Scotland in 1777. In 1782 he was appointed treasurer of the navy and member of the privy-council; but he continued only a short time in office, the coalition between Lord North and Mr. Fox having displaced his party. The triumph of his opponents was but temporary; and on their retreat from power he resumed his office under Mr. Pitt, whose firm partisan he approved himself during their joint lives. On the passing of the act of Parliament for regulating the affairs of the East India Company, Mr. Dundas was appointed president of the board of control; in 1791 he was made secretary of state for the home department; and in 1794 he became secretary at war. On the resignation of Mr. Pitt he also retired from public life; and when the former resumed the helm of state he was appointed first lord of the admiralty. In 1805 he was impeached, before the House of Lords, of high crimes and misdemeanours in his former office of treasurer of the navy. As the evidence adduced against him did not directly implicate him in the malversation proved against his deputy, he was acquitted. He did not, however, hold any situation afterwards, except that of privy-councillor. His death took place in May, 1811. He was created Viscount Melville in 1801, and was succeeded in that title by his son. The city of Edinburgh contains two public monuments to Lord Melville's memory—one, a marble statue, by Chantrey, which stands in the Parliament House; the other a column, surmounted by a statue, which stands in St. Andrew's Square.

DUNDEE, a royal and parliamentary burgh and seaport, Scotland, in the county of Forfar, finely situated on the north bank of the Firth of Tay, about 8 miles from the open sea, 37 miles N.N.E. of Edinburgh. It stretches along the Tay, or east to west, and of late years the suburbs have been greatly extended in both directions by the erection of handsome mansions and villas, and on the east stretch

nearly to Broughty Ferry. Its appearance from the sea and opposite shore, from which it is distant about 1½ to 2 miles, is at once striking and pleasing; an effect much enhanced by the beautiful green hills which form the back-ground of the picture, one of which, the nearest, called the Law, is 525 feet high. Another prominent eminence to the north-west, the Hill of Balgay, has been laid out as a cemetery and pleasure grounds. In the centre of the town is a large open space surrounded with good substantial freestone buildings, of four stories in height, called the Cross or Market-place, 360 feet long by 100 broad, from which a number of the principal streets diverge. The more recently formed streets are spacious and handsome, but most of those of more ancient date are narrow, irregular, and ill built. The most conspicuous object in Dundee is its old tower, 156 feet high, built in the 12th century, the only remaining portion of an edifice burned down some time ago; and to which three modern parochial churches have been built in form of a cathedral, the nave, choir, and transept respectively forming a separate church, and the whole constituting one of the most striking architectural features of the town. Many of the other churches are also elegant buildings. The other public buildings of note are—the town-hall, trades'-hall, the academy, the new exchange, containing, besides other accommodation, a handsome reading-room; the theatre, infirmary, and the royal lunatic asylum. To these may be added the jail and bridewell, erected at an expense of £26,000; and an imposing Norman triumphal arch, erected in front of the mid quay, to commemorate the landing at Dundee of Her Majesty Queen Victoria, in Sept. 1844. The latest addition is a handsome Gothic building named the Albert Institute, erected by subscription, and designed by Sir G. G. Scott. It is intended to give accommodation for the meetings of scientific and artistic bodies, and contains a free public library. It stands on a large piece of ground laid out in grass and shrubbery, near the royal exchange, forming altogether a handsome square in the centre of the town. Near it are the post-office, the savings-bank, the Eastern Club, and other public buildings. The most notable pleasure-ground is a beautiful park, consisting of 30 acres, presented by Sir David Baxter, Bart., and his two sisters, to the community. It lies on a fine slope to the east of the town, and commands an extensive and beautiful prospect. North of the park is the Morgan Hospital, for the maintenance and education of boys of parents in decayed circumstances.

Dundee has long been celebrated for its manufactures, particularly those of the coarser descriptions of linen, duck, and canvas. About 1830 a new raw material, viz. jute, was introduced, which has given rise to a very large branch of industry, and Dundee is now the chief seat of the linen trade in Scotland, and of the jute trade in Great Britain. In 1872 the import of flax and tow amounted to 37,221 tons, of hemp 1049, and of jute 91,430 tons. These substances are manufactured into many articles in combination, and whilst jute is used to a greater or less extent in every establishment, a large number of works are occupied entirely with that fibre. The coarser description of jute goods are used as wrapping—in the form of packsheet or bags—for nearly every description of goods, and by almost every nation in the world. Carpets are also extensively made from it. Linen and jute goods are largely exported to America, Australia, West Indies, and the Continent. At a recent date there were in Dundee seventy-two mills, about 8000 power-looms, and fully 200,000 spindles, employing more than 35,000 hands. There is also a large number of persons employed in hand-loom weaving and winding, and in sewing sacks and bags, making the total number of persons employed from 50,000 to 60,000. The annual value of goods of this class manufactured in Dundee and surrounding district is estimated at £8,000,000, the total quantity produced in Scotland being valued at £10,000,000. Ship-building both in wood and iron is extensively carried on, and there are large engineering establishments for steam-boilers, spinning and weaving machinery, and machinery in general. Another important branch of business is the northern seal and whale fishery, which is carried on by a fleet of large and fine screw-steamers. The blubber is brought home and boiled in Dundee, and almost the entire quantity is consumed in the spinning of the jute. Dundee has been long famous for its marmalade and other preserves and confectionery, which are sent to all parts of the world.

The harbour accommodation and docks of Dundee are of the best description, and include three large wet-docks, with a connected tidal harbour, and also graving-docks. Fine steamers run between London, Hull, Newcastle, and other ports. The large trade in importing coals from England is now done by screw-steamers. Much coal is also brought from the Scotch coal-fields by rail. The chief foreign trade is with the Baltic and Archangel in the importation of flax and hemp (now mostly by steamers), with Norway, Sweden, and Canada in timber, and with Calcutta in jute. The communication between Dundee and the opposite shore is maintained by steamers, which convey cattle, carriages, &c., as well as passengers. Several lines of railway already leave Dundee, and still greater facilities of communication will be gained when the great railway bridge across the Tay—10,320 feet in length, and with 89 spans, 14 of them 200 feet wide—is completed.

Dundee was at an early period a place of considerable note, and like most old towns, was originally walled. It was erected a royal burgh by William the Lion, was twice in the possession of the English under Edward I., was as often retaken by Wallace and Bruce, and in the reigns subsequent to that of the latter was ranked the third town in Scotland after Edinburgh. At the Reformation it was distinguished by the name of 'The Second Geneva,' for its zeal in behalf of the new faith. In 1645 it was besieged, taken, and sacked by the Duke of Montrose; and six years afterwards it was stormed by Monk, when a great number of its inhabitants were put to death, not fewer, it is said, than a sixth part, or about 1300 persons. During the reigns of the Scottish kings Dundee was one of their places of residence. It is the birthplace of Hector Boece, the historian; and of Admiral Duncan, the hero of Camperdown. Previously to the reform bill of 1868 the town returned one member to the House of Commons; it now returns two. Pop. 118,977.

DUNDONALD, THOMAS COCHRANE, TENTH EARL OF, was born in the vicinity of Culross, Perthshire, on the 14th of December, 1775, and when a mere boy was entered on the books of the navy as a midshipman. He embarked in 1793 with his uncle, then Captain, and afterwards Sir Alexander Cochrane, in the *Hind*, of twenty-eight guns. In May, 1795, when acting-lieutenant under his uncle in the *Thetis*, forty-two, he assisted in the capture of two out of a squadron of five French vessels off the American coast. After service in various other ships he joined the *Queen Charlotte*, the flagship of Admiral Lord Keith in the Mediterranean. While here he was despatched from Gibraltar Bay with the boats of the *Queen Charlotte* and the *Emerald* frigate to the relief of the *Lord Nelson* schooner, which had been hemmed in and attacked by several French privateers and gun-boats. This service was accomplished by him with

the greatest gallantry and success. On the 28th of March, 1800, he was appointed to the *Speedy* sloop-of-war of fourteen guns, and spread the terror of his name along the Spanish coast, having in the course of ten months captured thirty-three vessels, carrying 128 guns and 533 men, besides assisting in the capture of many others. One of his prizes was the *El Gamo*, of thirty-two guns, for the capture of which by boarding, off Barcelona, he was gazetted post-captain in 1801. Before he obtained this rank a misfortune had befallen him. The *Speedy* and her crew, after a desperate attempt to escape from a French squadron under Admiral Linois, had been compelled to surrender on the 3d of July, and he was in consequence a prisoner. On being exchanged he returned home and remained on half-pay till October, 1803, when he was appointed to the *Arab*, of twenty-two guns, and employed in the blockade of Boulogne. The following year he removed to the *Pallas* frigate, thirty-two guns, and sailed for the coast of Spain with despatches for his uncle, Admiral Sir Alexander Cochrane, then blockading Ferrol. Here he was again most successful in making prizes, one of which, the *Fortuna* from Rio de la Plata, had specie on board to the amount of £150,000. In the spring of 1806, still in the *Pallas*, he proceeded to the Bay of Biscay, and after cutting out a corvette of fourteen guns and ninety-five men, which was lying in the Gironde under the protection of two batteries, scoured the French coast, destroying the semaphores and storming a battery. The following August he removed to the *Impérieuse*, of forty-four guns, and within a month destroyed fifteen of the enemy's vessels, laden chiefly with wine and provisions. The Spanish war of independence having now commenced, Lord Cochrane was sent to the coast of Catalonia to co-operate with the patriots, and rendered essential service by many daring exploits. One of these was his volunteered defence of Trinidad Castle, attached to the fortress of Rosas, with eighty of his own men and as many Spaniards, and the repulse of an assault made by a French force of 1000. His character for daring being now completely established, he was selected in 1809 to superintend the destruction of a French fleet by fire-ships. It was anchored in Basque Roads under the protection of formidable batteries, and had for some time been watched by Admiral Lord Gambier. Unfortunately the Admiral was as much characterized by caution as Lord Cochrane was by daring, and failed duly to follow up the destruction which the latter had commenced, by succeeding, after almost superhuman efforts, in striking terror into the enemy by his terrific explosions, and driving several of their ships ashore. Lord Cochrane was chagrined above measure at this comparative failure, and as he had some time before been returned to Parliament, and was then sitting for Westminster, he did not hesitate, when a vote of thanks was proposed to Lord Gambier for his conduct, to oppose the vote, on the plain ground that, so far from deserving thanks, he ought not to be allowed to escape censure. The result was a court-martial, which acquitted Lord Gambier, and found all the charges brought against him groundless. The previous parliamentary career of Lord Cochrane had offended the government; his exposure of abuses at the admiralty had exasperated those who allowed or profited by them; and there cannot therefore be a doubt that, in official quarters, there was a willingness to stop his career of preferment, as soon as any plausible pretext could be found for it. This was unfortunately furnished sooner than any had anticipated. It would far exceed due limits to give a full account of the false report of Napoleon's downfal, which was got up in 1814 evidently for stock-jobbing purposes, and of the proceedings which followed upon it. Suffice it to say, that Lord Cochrane, suspected of being concerned in it, was brought to trial, convicted, fined, imprisoned, stripped of his rank of the knighthood of the Bath, and expelled from the House of Commons. He had from the first strongly protested his innocence, and many not inclined to favour him believed that at the worst he was the dupe of a more designing relative. It was remarked, moreover, that Lord Ellenborough, who presided at the trial, entirely forgot his position as an English judge; and so far from leaning to the accused as became him, was evidently bent on obtaining a conviction. On these and similar grounds great doubts were felt as to the justice of the sentence which had been pronounced, while the electors of Westminster did all they could to wipe off the stigma, by again returning Lord Cochrane as their member. The effect, however, was to ruin all his prospects in this country, which he therefore quitted in 1818, to command the fleet of Chili, which had thrown off the yoke of Spain, and was then struggling for independence. He fully repaid the trust thus reposed in him by many exploits, among the most memorable of which, both for the skill and gallantry displayed, and the important results which followed, was the cutting out, in 1820, of the *Esmeralda*, a large 40-gun frigate, from under the guns of the Castle of Callao. He subsequently obtained the command of the Brazilian fleet from the Emperor Dom Pedro, and after his return to Europe spent part of 1827 and 1828 in the cause of the Greeks. In 1830, after the accession of King William IV., and the formation of a Whig ministry, Lord Cochrane was restored to his rank in the British navy; in 1831, by the death of his father, he succeeded to the name and title of Earl of Dundonald; in 1841 he became vice-admiral of the blue; in 1847 he was again made a knight of the Bath; in 1848 he was appointed commander-in-chief on the North America and West India station; and in 1851 and 1854 respectively he became vice-admiral of the white, and rear-admiral of the United Kingdom. To the very last his intellect found full employment in the pursuit of inventions, from which he anticipated and partly realized both fame and profit; and in the composition of an autobiography, which, though left incomplete by his death on 31st October, 1860, in his eighty-sixth year, is a most interesting addition to this species of literature.

DUNDRUM BAY, an inlet of the Irish Sea, on the east coast of Ireland, county of Down, between St. John's Point on the north-east and Dunmore Head on the south-west, 5 miles south of Downpatrick. It is 9 miles wide at its entrance, and nearly 3 inland. It is exposed to a heavy swell in south and south-east winds. The steam-ship *Great Britain* was stranded here in 1846, but was got off in the following year without having sustained any considerable damage.

DUNEDIN, a town, New Zealand, capital of the province of Otago, situated in lat. 45° 45′ S.; stands at the upper extremity of an arm of the sea, about 13 miles long, and contains a population of 14,857, or including the suburbs of Roslyn and Caversham, 21,511. Though founded in 1848 by the New Zealand Company, its more rapid progress dates only from 1861, when extensive gold-fields discovered in the neighbourhood attracted a large influx of population. For several years the town and province made great strides in wealth and prosperity, but the gold-fields falling off checked the abnormal growth of the city, and its progress since, though slow, is likely to be of a more sure and permanent nature. It is as well laid out as the hilly character of its site will allow, is well paved, lighted with gas, and

favoured with a good supply of water from a reservoir at the head of the Water of Leith Valley. There are many handsome buildings, both public and private; the post-office, hospital, and government buildings, several banks, the athenæum and mechanics' institute, the freemason's hall, &c. There are about a dozen churches in Dunedin, some of which are fine buildings. Wool is the staple export of the town. In 1853 the quantity exported was 5000 lbs.; in 1859 it rose to 900,000; and in 1871 to 13,244,594 lbs. There is a regular line of steamers between this port and Melbourne. Sea-going vessels only come up as far as Port Chalmers, but small craft and light-draught steamers ascend to Dunedin.

DUNES. See DRIFT SAND.

DUNFERMLINE, a royal and parliamentary burgh of Scotland, in the county of Fife, situated 13 miles north-west of Edinburgh. The principal part of the town is seated on a declivity, commanding most extensive prospects, and descending towards the Frith of Forth, from which it is distant 3 miles; but that portion of it termed Nether Town occupies a plain. The streets, though irregular, and many of them narrow and inconvenient, are well built, and the houses abundantly supplied with water by pipes from a considerable distance. The parish church, a venerable and interesting object, somewhat resembling the cathedral of Durham, is all that remains of a sumptuous and richly endowed Benedictine abbey, founded by Malcolm Canmore, and destroyed by Edward I. It was the place of sepulture of the founder, his queen, and seven subsequent monarchs, including Robert Bruce, whose tomb and remains were brought to light in 1818, during the erection of the handsome church which adjoins the east end of the ancient pile. The other principal public buildings are the town-house and prison, erected in 1769; the guild-hall, built in 1808, with an elegant spire, chiefly occupied as a court-house; the music-hall, new jail, poorhouse; the grammar and other schools; the mechanics' institute, the public library, and various charitable endowments. Dunfermline early took the lead in the manufacture of table-linen, and is still unrivalled by any other town in the kingdom. This manufacture and that of coloured worsted and cotton covers, which has become the other staple, now occupies about half the population. There are also spinning-mills, iron-works, hand and power loom factories, and in the neighbourhood several important collieries. Dunfermline is a station on the North British Railway.

From a very early period Dunfermline was a royal residence, and there are still some ruins of a castle, anciently occupied by Malcolm Canmore; and the remains of a palace, which was rebuilt by Anne of Denmark, said to have been the birth-place of Charles I. The privileges of this town emanated from its monastery for nearly two centuries, but by a charter of James VI. it was erected into a royal burgh, in 1588. The town is remarkable as being the theatre in which two principal dissents from the Established Church of Scotland have taken their rise—namely, the Seceders, under Ralph Erskine; and the Relief, under George Gillespie, now joined under the name of United Presbyterians. Pop. 14,953.

DUNGANNON, a parliamentary and municipal borough, Ireland, county of Tyrone, on a height above a branch of the Blackwater, 35 miles west by south of Belfast. It is an ancient place, and continued to be the chief seat of the O'Neils, the kings of Ulster, from the earliest period of Irish history. Its principal edifice is a courthouse with a bridewell attached, forming a large and handsome structure. Its chief manufactures are linen and coarse earthenware. In the vicinity are extensive lime quarries and collieries. The town returns a member to the House of Commons. Pop. 3955.

DUNGARVAN, a parliamentary and municipal borough and seaport, Ireland, county of Waterford, on a tongue of land formed in the Bay of Dungarvan, by the mouths of the Bricky and Colligan. It is a finely situated town, of agreeable appearance, and is much resorted to for sea-bathing. Its ancient castle, situated in the centre of the town, is now used as a barrack. The harbour is very shallow, and as there is little trade the inhabitants depend chiefly on the hake and herring fisheries. Grain, butter, and cattle are exported to some extent. Dungarvan returns a member to Parliament. Pop. 7700.

DUNG BEETLE. This term is applied to a large number of coleopterous insects of the Lamellicorn family, or that family in which the antennæ terminate usually in lateral leaflets. The sacred beetle of Egypt, *Ateuchus sacer*, is one of a group of large forms found on the Mediterranean shores. This species, which is immortalized in Egyptian carvings, is black, but not shining; its flat head is provided with two tubercles, the anterior limbs are without tarsi, and the tibiæ are furnished with four finger-like spines. The posterior limbs are long, and in the female fringed. The female places the egg in a pellet of dung and rolls it till a pill-like mass is formed: this it drags with the hind-legs, or pushes or carries on its head till a suitable spot is found for its interment. The strong incurved spinous fore-legs are good tools for digging, and the fringes of the hind limbs smooth over the grave. When the difficulties are too great for the parents, the aid of others is procured, and they all then tug and push till the obstacles are overcome. This dispersal of dung and consequent subsoil manuring is said to have given the animal its peculiar sanctity among an agricultural people like the Egyptians. The tropical *Ateuchi* are more brilliant in lustre. The genus *Copris* is also of wide distribution; it burrows beneath the dung, and lays its eggs in vertical shafts, each with a pellet of dung. The *Onthophagus* has, in the male, two long curved horns on the head, but these are absent in the female. *Aphodius*, which has five abdominal rings, not six like the previously-named genera, deposits its eggs in the dung. The *Geotrupes*, or 'shard born beetle' of temperate regions, which flies in the evenings with a loud hum, is from half an inch to an inch in length. Its eggs are laid in underground burrows, which are plugged with dung. The peculiar habit whence the name is acquired has for its object the protection and nutrition of the larva, and the instinct is the more remakable that with the operation the interest of the parent in its offspring ends.

DUNKELD, a city and burgh of barony, Scotland, on the left bank of the Tay, 14 miles north by west from Perth, in the midst of beautiful and romantic scenery. It is a very ancient place, and from 850, when Kenneth I. removed the remains of St. Columba from Iona to a church which he had built here, became the metropolitan see of Scotland, till supplanted by St. Andrews. The choir of the ancient cathedral, the ruins of which are finely situated on the banks of the river, is still used as the parish church. Near it is the ancient palace of the dukes of Athole, and a more splendid modern palace still unfinished. The grounds of this ducal family are unsurpassed in Scotland for extent and beauty; they lie on the west and north of Dunkeld, and include the cathedral, Craig Vinean, and Craig-y-Barns, 50 miles of walks, and 30 miles of drives, Ossian's Hall, and the rumbling bridge over the Bran. The two first larch-trees planted in Britain, and brought from the Tyrol in 1738, are shown in

the park. The largest is 100 feet high, and has a girth of 15 feet at 2 feet above the ground.

DUNKIRK (French, *Dunkerque*), a seaport town, France, department of Nord, at the S.E. entrance of the Strait of Dover, 46 miles E.S.E. of Dover, and 42 miles N.W. of Lille. The country around is a dreary waste of sand-hills, and the shore is so encumbered with sand-banks, that the harbour, notwithstanding the vast sums which have been expended upon it, is still indifferent; though unquestionably the best which France possesses on its N.E. coast. The town is advantageously situated for trade, having, in addition to its harbour, the benefit of extensive communication with the interior by the united canals of Bergues, Bourbourg, and Furnes, and also by the railway Du Nord; is surrounded by walls, and otherwise defended by forts and outworks, so as to rank as a fortress of the first class, and is well-built, possessing, in particular, several squares, which are large, regular, and handsome. The objects most deserving of notice are the church of St. Eloi, a Gothic structure with a belfry containing chimes; the town-house, built in 1644; the college, occupying the site of an old Jesuit church; the public library of 18,000 vols.; the museum of paintings, which contains several pictures by Rubens, Holbein, Giorgione, Cigoli, and other masters; the theatre and concert rooms; the Champ de Mars; the naval docks, and the basins for containing water to scour the harbour; and the pier, which stretches far out into the sea, has both a tower and a lighthouse, and affords an excellent promenade. The manufactures consist chiefly of earthenware, iron castings, leather, soap, starch, ropes, and there are numerous sugar-refineries, breweries, gin distilleries, and salt works. The trade, both foreign, coasting, and transit, is important, and is chiefly in corn, wine, brandy, coal, fish, and colonial produce. A considerable number of vessels are engaged in the cod-fishery. Dunkirk appears to have become a place of some importance in the tenth century, when it was first surrounded by walls. The possession of it was repeatedly contested by the Spaniards and French. In 1658 it was given up to the English by Turenne, after a victory which their exertions had chiefly enabled him to gain, and continued with them till 1662, when Charles II. sold it to Louis XIV. for the sum of £400,000. Pop. 33,083.

DUNLIN. This bird is one species of the genus *Tringa*, to which the sandpiper, knot, and stint belong. It is smaller than the snipe; is in winter ashy-gray above, white below, with dark spots on the breast: in the breeding season it is mottled with rufous above, and the breast is crossed with black. The straight bill is adapted for boring, and its cavity reaches to the extremity, not, as in the snipe, stopping short of the tip. In Scotland there are several local varieties, those of the east being a half larger than those of the Hebrides. While all parts share in the reduction of size seen in the island birds, the bill sometimes shows the peculiarity of depression towards the base so as to resemble the broad-billed sandpiper. The American *Tringa alpina* is a frequent visitor to the east of Scotland, and there is some ground for believing that these large birds are only varieties of the dunlin, whose tendency to local modification has earned it its name, *T. variabilis*. It breeds on moors and marshes along with the snipe and plover, returning after the season to the sandy and muddy reaches of the coast.

DUNMOW, GREAT and LITTLE, two parishes, England, county of Essex. The former on a height above the Chelmer, 32 miles north-east of London, has a large ancient church and several other places of worship; the latter is well known, from the custom in it of giving a flitch of bacon to any couple, who, a year and a day after their marriage, could swear that they had neither quarrelled nor repented. It is said to have been claimed only eight times from the reign of Henry VI., the last two occasions being in 1855 and 1860.

DUNNAGE, a naval term applied to loose wood or other miscellaneous substances, such as horns, rattan, old mats or sails stowed amongst casks and other cargo, either to prevent their motion or to protect them from leakage.

DUNNET HEAD, a remarkable promontory, Scotland, in the county of Caithness, at the western entrance of, and projecting into the Pentland Firth, which is here about 7 miles broad, the most northern point of the mainland of the kingdom. It rises to the height of 400 feet above the level of the sea. On the N.W. extremity there is a lighthouse 346 feet high.

DUNNING, JOHN, Lord Ashburton, an eminent lawyer, was the son of an attorney at Ashburton, in Devonshire, where he was born October 18, 1731. He was educated at the free school of his native place, and served his clerkship to his father; but early determining to study for the bar, he pursued a course of assiduous application, both before and after his admission. The first thing which established his character was his employment in 1759 to draw up a defence of the East India Company against the claims of the Dutch. This memorial, being esteemed a masterly production, gained him considerable practice, which was prodigiously augmented by his becoming counsel for Wilkes in all the causes produced by the question of the general warrants. He distinguished himself in such a manner on this popular occasion as to obtain the character of a sound constitutional lawyer; and his practice soon after became the most lucrative at the English bar. In 1766 he was chosen recorder of Bristol, and in 1767 solicitor-general, which office he resigned in 1770, in consequence of the resignation of his patron, Lord Shelburne, by whose interest he had been chosen member for Calne, in Wiltshire. From the time of his resignation he remained a firm opponent to the ministry who conducted the American war; and on the return of Lord Shelburne to power in 1782 he was made Chancellor of the Duchy of Lancaster, and advanced to the peerage by the title of Lord Ashburton. He died August 18, 1783.

DUNNOTTAR, a parish, Scotland, famous for its ancient castle, situated on a beetling cliff in the German Ocean, 2 miles south by east from Stonehaven. About the year 1296 Wallace is said to have set fire to the church, which stood on this rock, and in which 4000 English had taken refuge. In 1394 the first castle was built by Sir Wm. Keith, marischal of Scotland. During the Commonwealth this castle was selected as the strongest place in the kingdom for the preservation of the regalia from the Republican forces, which then overran the country. Lambert, one of Cromwell's generals, besieged the place, which was starved into capitulation. The regalia had, however, been previously removed by a stratagem, in which Mrs. Granger, the wife of the parish minister, played the chief part. She brought away the crown hid among some clothes in her lap, her servant-maid carrying the sword and sceptre in a bag of flax on her back. In 1685 the castle was used as a state prison for 167 Covenanters, who had been seized at various times in the west of Scotland during the persecution under Charles II. They were all thrown into a chamber, since called the 'Whigs' Vault,' where many of them died. The fortress was dismantled soon after the rebellion of 1715, on the attainder of James Keith, the last earl-marischal.

DUNOIS, JEAN, Count of Orleans and of Longueville; born 1402; a natural son of Louis, duke of

Orleans. Dunois made the name 'Bastard of Orleans' illustrious by his military exploits in the war for the liberation of France, then completely in the power of England. He began his career with the defeat of Warwick and Suffolk, whom he pursued to Paris. Being besieged by the English he defended Orleans with the greatest courage until relieved by the Maid of Orleans. To the Count of Orleans belongs almost entirely the honour of expelling the enemies of his country from Normandy and Guienne. In 1450 he had completely freed France from the presence of the English, and it may truly be said that Charles VII. was indebted to him for his crown. Dunois received from him the title of 'deliverer of his country,' the county of Longueville, and the dignity of high chamberlain of France. Louis XI., who hated the ministers and counsellors of Charles, deprived Dunois of all his titles and dignities; but on finding how dangerous an enemy he had raised (Dunois becoming the soul of the League for the Public Good which was formed against the king), the royal favour was speedily extended, and a complete reconciliation took place at Conflans (1465). He died in 1468.

DUNOON, a celebrated watering-place, Scotland, county of Argyle, beautifully situated on the shore of the Firth of Clyde, 25 miles west by north from Glasgow. It consists chiefly of ranges of neat villas stretching along the shore. On a green rocky knoll are a few remains of the castle of Dunoon, a residence of the family of Argyle till an early part of the seventeenth century. Pop. 3756.

DUNS, JOHN, commonly called *Duns Scotus*, an eminent scholastic divine of the thirteenth and fourteenth centuries. The place of his birth has been much disputed, England, Scotland, and Ireland all contending for the honour of having given him birth. He was admitted when young into an institution belonging to the Franciscan friars at Newcastle, whence he was sent to Merton College, Oxford. Becoming celebrated for his skill in scholastic theology, civil law, logic, and mathematics, he was in 1301 appointed divinity professor at Oxford, and the fame of his learning and talents drew crowds of scholars from all parts. In 1304 he was sent by his superiors to Paris, in the university of which city he was admitted to the highest honours, and appointed professor and regent in the theological schools, in which situation he acquired the title of 'the most subtle doctor.' Nothing, however, could be more barren and useless than the chimerical abstraction and metaphysical refinements which obtained him this title. Duns opposed Thomas Aquinas on the subject of grace and free-will; and hence the *Scotists* are opposed to the *Thomists*. The immaculate conception of the Virgin Mary was another of the tenets which divided these fierce antagonists; and it is believed by many authors that it was Duns who first propounded it. There can be no doubt but that the bitterness of the quarrel between the Scotists and Thomists was intensified by the strong rivalry of the Franciscans and Dominicans, the order to which Duns Scotus and Aquinas respectively belonged. Duns was also the apostle of realism, which was opposed to the systems of nominalism and conceptualism promulgated by the other sections into which the schoolmen were divided. In the year 1308 he was sent to Cologne by the head of his order, to teach theology, but was cut off by an apoplexy, and, as a disputed account asserts, buried before he was actually dead, as was discovered by an examination of his grave. His death happened, according to some writers, in his thirty-fourth, and to others in his forty-third year. He left behind him numerous works, which were collected by Lucas Waddingius, in twelve vols. folio (Lyons, 1639).

DUNSE, a town in Berwickshire, 35 miles south-east of Edinburgh, upon the banks of the Whitadder, a neat place, consisting of several spacious well-paved streets terminating in a square, where the markets are held, and in the centre of which there is a town-house in the Gothic style. Besides the church, an elegant fabric with a spire, built in 1792, there are places of worship for various denominations of Dissenters, and a free grammar-school in high repute. Here are manufactures of woollen cloth and fine linen, an extensive bleaching-ground, a large brewery, and several paper-mills, established on the Whitadder. Pop. 2618.

DUNSTABLE, a town, England, county of Bedford, 32 miles north-west of London, at the eastern base of the Chiltern chalk-hills, on a branch of the London and North-western Railway. It consists chiefly of one main street, intersected by another. Pop. 4558. It was an important Roman station, and had a palace and a priory founded by Henry I. Part of the latter is used as the parish church. Dunstable is famous for its manufactures of straw plait and bonnets. In its vicinity immense numbers of larks are taken in winter, and sent to the London market.

DUNSTAN, ST., an Anglo-Saxon divine and statesman of the tenth century, alike celebrated in legendary and authentic history, was born at Glastonbury in 925, and was educated in the famous abbey at that place. He acquired a knowledge of the Latin language and of philosophy, and studied the Scriptures and the writings of the fathers; besides which he became skilled in music, painting, carving, and working in metals. He was introduced early in life to the court of King Athelstan by his uncle Adhelm, archbishop of Canterbury. Some indiscretion, or the jealousy of rivals, compelled him to retire from court; and the disappointment of his prospects, together with a dangerous fit of sickness, seriously impressed his mind, and led him to seek for tranquillity in the monastic life. He took the vows at Glastonbury, and devoted himself with ardour to the duties of his profession. On the death of Athelstan, Edmund, the brother and successor of that prince, invited him to court; and Edred, the next king, made him his prime minister and principal director in civil and ecclesiastical affairs. On the death of Edred, his nephew Edwy, who was probably not more than fourteen years of age, ascended the throne. The enmity of the profligate courtiers was particularly directed against Dunstan, who was obliged to flee from his native country. He took refuge in Flanders, where he remained till he was recalled to England by King Edgar, to whom the imprudent Edwy had been obliged to cede a part of his dominions. Dunstan was made Bishop of Worcester, and when Edgar became possessed of the whole kingdom, was raised to the see of Canterbury. In this station his influence was exerted in promoting the introduction of the rule of St. Benedict, which inculcated vows of celibacy upon members of the monastic institutions in England, and in bringing that country more immediately under Papal authority. The secular priests, who were generally married, were expelled from religious houses, and replaced by Benedictine monks, wherever the power of Dunstan extended. During the reign of Edgar he was supported in the execution of his plans by the royal authority; but under Edward the Martyr he experienced great opposition from the patrons of the secular clergy; and after Ethelred II. became king his influence still further declined, and he thenceforward interfered but little in public affairs. He died in 988. Few characters in English history have been more variously represented than that of Dunstan. The monks represent him as the most learned and accomplished prelate and most eminent statesman of his age. Popular tradition paints him as a master of

magic arts, subjecting demons to his power. Osbern, who wrote the life of Dunstan a century after his decease, first appears to have propagated the legendary tales which have been so injurious to his fame, and of which no notice is taken by a contemporary anonymous biographer, whose memoir of the saint has been published by the Bollandists.

DUODECIMAL SYSTEM, in numeration. In recent times it has been proposed to substitute for the present decimal scale of nine digits and a cipher a duodecimal scale of eleven digits and a cipher, thus making twelve (Latin, *duodecim*) its base. In favour of the system it is urged that 12 admits of a greater number of division into equal parts by 2, 3, 4, and 6; but most mathematicians consider it as not having sufficient superiority over decimals to counterbalance the immense inconvenience of making a change. The term *duodecimals* is also given to the system of compound numbers used in calculating surfaces and solidities from measures taken in feet, inches, and lines.

DUODECIMO (often contracted 12*mo*) is that form of volume in which each leaf forms a twelfth part of the sheet or folio.

DUODENUM, the commencement of the intestinal canal, the first of the smaller intestines, so called because in some animals it is found to be as long as the breadth of twelve fingers.

DUPATY, Charles Marguerite Jean Baptiste Mercier, born 1746 at Rochelle. In 1767 he became advocate-general to the parliament of Bordeaux, afterwards *president à mortier* of that body, and drew upon himself by his love of strict justice the persecutions of the ministerial despotism which oppressed France in the last years of Louis XV. Having written in the name of the parliament of Bordeaux against the Duke of Aiguillon when this nobleman became minister (1770), he was sent to Pierre-en-Cise (a fortress at Lyons, once a state prison), and afterwards banished, until the accession of Louis XVI. Being acquainted with the defects of the ancient administration of justice in France, he made every exertion to expose them. The memorial by which he preserved the lives of three innocent citizens of Chaumont who were condemned to the wheel deserves particular mention. His other works are Reflexions historiques sur les Loix criminelles, a valuable work; various Discours académiques; and Lettres sur l'Italie en 1785, which appeared in 1788 in two volumes. These letters, among many prejudiced views, contain some excellent observations on the arts, and interesting descriptions of natural scenery; but his style is often disfigured by laboured ornaments. He died in 1788 at Paris.—His son, Louis Marie Charles Mercier, born at Bordeaux September 29, 1771; died at Paris November 12, 1825. He was the restorer of sculpture in France, a member of the Institute, and professor in the École des beaux Arts; was at first an advocate, served during the revolution as a dragoon, then as chartographer, and finally went to Rome, where he studied sculpture under the direction of Lemot, and during a residence of eight years made himself known by numerous works. His principal productions are Ajax pursued by Neptune, his equestrian statue of Louis XIII. (1816), and Orestes pursued by the Furies. Cortot, his successor in the Academy, completed some of his works.

DUPERRÉ, Victor Guy, Baron, born at Rochelle in 1775, first sailed in a merchant vessel, but afterwards entered the navy, and having been taken prisoner by the British in 1796 did not obtain his liberty by exchange till three years after. In 1803 he was employed with the flotilla of Boulogne, and afterwards cruised with the *Veteran*, commanded by Jerome Bonaparte, on the coasts of Africa and America. After his return he was appointed in 1806 to the command of the *Sirène*, in which, in 1808, he carried out troops to Martinique. On his return he was intercepted by an English man-of-war, which endeavoured to prevent him from entering L'Orient; but after a fight, in which he displayed much valour and good naval tactics, he gained the shelter of the forts on the island of Groix, and ultimately reached the port in safety. Napoleon rewarded him by conferring on him the rank of captain. He now took the command of the frigate *Bellona*, sailed in 1809 from St. Malo for the island of Mauritius, and during a cruise in the Indian Sea took the British corvette *Victor*, several merchant vessels, and the Portuguese frigate *Minerva*. In 1810 he returned with his prizes, and reached Mauritius in view of the British squadron by which that island was then blockaded. Three years later he again sailed with three ships, and returned after taking two large British East Indiamen. He found the island blockaded, and though he forced the blockade the whole island was forced to capitulate in 1810. After Duperré's return he received the title of baron; in 1811 he was raised to the rank of vice-admiral, and commanded in the Mediterranean. In the beginning of 1812 he was naval commander-in-chief in the Adriatic, and had succeeded in forming extensive building docks at Venice, and raising a powerful squadron, when the events of 1813–14 obliged the French to evacuate Italy. During the Hundred Days he guarded Toulon against the attempts of the British and Sicilian troops which landed at Marseilles. In 1818 he returned to the West Indies to take the command of the French ships on that station. In 1823 he commanded the squadron employed in the siege of Cadiz. In 1830 he superintended the landing of the troops on the coast of Algiers, and contributed greatly to the capture of the capital. After the revolution of July he was raised to the peerage, and held the portfolio of marine, first from 1834 to 1836, and again in the ministry of 1840. Sickness, however, obliged him to resign, and he died at Paris in 1846.

DUPETIT-THOUARS, Aristide Aubert, a famous naval captain, born at Boumois, near Saumur, in 1760, when a mere boy was so smitten with the love of a sea life by reading Robinson Crusoe that he ran off from the military school of Laflèche and attempted to enter himself as a cabin-boy in a vessel at Nantes, but was discovered and sent back. He afterwards entered the military school at Paris, and laboured assiduously at his studies, though his own inclinations were thwarted and he was intended for land service. At length, however, on the commencement of the war with England in 1778 he had an opportunity of entering the navy, and so distinguished himself on several occasions in the West Indies that he obtained the command of the *Tarleton*. He afterwards fitted out a vessel by subscription, and set out with the double object of searching for La Pérouse and of carrying on the fur trade on the north-west coast of America. The voyage proved very unfortunate. After he had been taken prisoner by the Portuguese, and long lain in a dungeon at Lisbon, he went to North America, where he made two attempts to reach the north-west coast by land. As soon as the storms of the French revolution were over he came back and again entered the naval service. On the expedition to Egypt he commanded an 80-gun ship. He foresaw the only result which could be anticipated if it was resolved to wait for Nelson's attack in the place selected in the roads of Aboukir, and advised immediately to set sail. But though his advice was disregarded he fought with undaunted valour against the enemy, and fell in the struggle, 1st August, 1798. His MSS. and correspondence were published by his sister in three vols. 8vo, under

the title of Lettres, Mémoires et Opuscules d'Aristide Dupetit-Thouars.

DUPLEIX, Joseph, governor of the French possessions in India, was the son of a wealthy farmer-general and director of the East India Company, and born in 1697. He early displayed considerable talent for mathematics and the exact sciences, and in 1720 was appointed first member of council at Pondicherry, and ten years afterwards director of the French factory at Chandernagore. In this capacity, while attending zealously to the interests of his employers, he contrived by engaging in private trade to accumulate a large fortune. In 1742 he received the appointment of governor-general, and proceeded to Pondicherry to enter upon the functions of his new office. At this period he conceived the magnificent design of rendering France paramount in India, and with this view cultivated assiduously the friendship of the surrounding native potentates. On the breaking out of war between Great Britain and France in 1746 Dupleix formed the project of wresting Madras from the former country, but was anticipated by La Bourdonnais, governor of Bourbon and the Mauritius, who, having fitted out an expedition from thence, arrived before the town and compelled its surrender. The wrath of Dupleix at this achievement was extreme, and his influence so far prevailed that, in disregard of the terms of capitulation, the British governor and the principal functionaries were transported as prisoners to Pondicherry, and other conditions of the compact shamelessly violated. This rivalry of their two leading officers proved extremely detrimental to French interests in India, but the energy and talents of Dupleix would, if properly supported, have secured for his country an ascendency which Britain would have had some difficulty to overthrow. By his vigorous defence of Pondicherry the British admiral Boscawen was compelled to raise the siege which he had laid to it, and by his diplomatic abilities additional and important acquisitions of territory were made from the native powers. Unfortunately for France, unworthy jealousies and personal interests exerted such influence with the home authorities that no adequate support was furnished to Dupleix in the prosecution of his scheme; and this, combined with constant importunities from the British court, who represented him as a firebrand and stirrer up of strife, occasioned his recall in 1754. He proceeded to France, and there experienced the treatment which, at that disgraceful period of her history, was manifested by France towards all her great men in India, without exception. No redress could be obtained by him, and payment of nearly 13,000,000 francs which he had advanced to the French factory at Pondicherry was shamelessly withheld. In a vain endeavour to procure what was justly due to him, and a recognition of his services to the public, Dupleix lingered out the remaining years of his life, and died in poverty in 1764.

DUPONT, Jacques Charles, surnamed *De l'Eure*, a French statesman, was born 27th February, 1767, at Neubourg, in Normandy. He was practising as an advocate in his native province when the revolution broke out (1789), and was made a judge in one of the law courts at Louviers in 1792. In 1798 he was a member of the Council of the Five Hundred, which was dispersed by Murat on the 18th Brumaire. In 1811 he was nominated president of the court of justice at Rouen, and in 1813 vice-president of the corps législatif. On the restoration of the Bourbons Dupont signalized himself as a leader of the opposition. In 1830, after the revolution of July, he was made minister of justice—an appointment which he threw up at the end of six months. After the fall of Louis Philippe he became a member of the provisional government. On the accession of Napoleon III., in 1852, he ceased to take part in public affairs. He died 3d March, 1855, at Rouge-Pierre, in Normandy. Dupont was called by his political friends the 'Aristides of French liberalism.'

DUPONT, Pierre, surnamed *De l'Etang*, born at Chabanais, in 1765, was educated for the artillery, and served first with the French legion in the Dutch service, and in 1791 in the French army, where he was appointed adjutant to General Dillon in the army of the north. In 1792, during the retreat from Tournay ordered by Dumouriez, Dillon was slain, and Dupont in endeavouring to defend him was severely wounded. When sufficiently cured he again joined the army in Belgium. Here, by his skilful arrangements as a staff officer, he prevented Denmark from falling into the hands of the Duke of York, and was promoted to the rank of brigadier-general. In 1793 he quitted the army to escape from the storms of the revolution, and first appeared again as superintendent of the topographical cabinet under the directory, which also made him director of the war depôt. After the 18th Fructidor he lost his employments for a short time; but after the proceedings of the 18th Brumaire, in which he took an active part, he was appointed head of the general état-major of the army of reserve assembled at the foot of the Alps, and distinguished himself in Italy at the battle of Marengo. As governor of Piedmont he, in 1800, pushed forward into Tuscany, where he established a provisional government, and then defeated a superior Austrian force at the passage of the Mincio, near Pozzolo. In 1804 he was invested with the title of count, and in 1805 joined the army in Germany, where he exerted himself near Ulm, and freed Marshal Mortier when hemmed in by a body of Russian troops. He was also very active in the campaign of 1806 against the Prussians, and in 1807 contributed by his skilful tactics to the victory of Friedland. In 1808 he obtained the command of a division in Spain, but brought himself into such a position that he was obliged to sign the disastrous capitulation of Baylen. Napoleon was so provoked that he brought him to trial, and kept him a prisoner till 1813. He was first restored to active service on the restoration of the Bourbons, and in 1814 became minister of war, but only held the office for a short time. He next obtained the command of the twenty-second military division, and though deprived of it during the Hundred Days, resumed it on Napoleon's second downfal. In 1815 he was elected member of the chamber of deputies by the department of Charente, and retained it with some interruptions till the revolution of July. He lived in retirement after 1835, and died at Paris in 1840.

DUPONT, Pierre, a writer of French political songs, was born at Lyons, 23d April, 1821. He was educated by his godfather, a priest, and began to write and compose songs at an early age. After issuing a volume of poems in 1844, he went to Paris and obtained a place in the office of the secretary of the Institute. After the revolution of Feb. 1848 he came forward as the minstrel of socialism, and proved obnoxious to the government which came into power in December, 1852. He was arrested, imprisoned, and condemned to be banished for seven years; but the intercession of his friends soon procured his release. After that event he spent a gay and careless life by the Rhone, penning and singing his ballads one day in the mansions of the rich and the next in the cottages or workshops of the poor. His songs, which brought him fame, did not bring him fortune, and he died comparatively poor at St. Etienne (Loire), 25th July, 1870. His works (songs and music) appeared in 1854 in four vols. 8vo.

DUPONT DE NEMOURS, Pierre Samuel, born at Paris, December, 1739, distinguished as well for his knowledge and talents as for his mild and benevolent character, his excellent principles, and his blameless life; lived almost unknown at Paris as a private man of letters until 1773, when his principles of philosophy and political economy set forth in his Les Ephémérides du Citoyen, excited the displeasure of the minister Choiseul, and obliged him to leave France. Several foreign princes offered him a reception and conferred honours upon him. He returned, however, to his native country, and accepted of a small place given him by Turgot, minister of finance. In 1782 and 1783, with Dr. Hutton, the English agent, he negotiated the basis of the treaty by which the independence of the United States of America was acknowledged. As inspector-general of commerce and manufactures, and as a councillor of state, he afterwards did much to encourage French industry. In 1787 and 1788 he was appointed by Louis XVI. secretary to the assembly of the notables. In 1789 he became a member of the first national assembly, where he distinguished himself by his principles, his courage, his talents, and his firm opposition to the intrigues of factions. He was twice president of the national assembly, and always supported moderate principles. Under Robespierre he was imprisoned, and nothing but the fall of the tyrant preserved him. He was afterwards a member of the council of elders. After the directory was abolished he went to America, in 1798. In 1802 he returned to France, but did not at that time take any office, notwithstanding the offers made him by Napoleon. The confidence of his fellow citizens followed him in his retirement, as was shown by his appointment to several important offices. In 1814 Dupont was made secretary of the provisional government which prepared the way for the return of the house of Bourbon to the throne of France. After Napoleon's return from Elba he went again to America, of which country his two sons had already become citizens. He died there in 1817. Besides various political treatises, he is likewise the author of a French translation of the first three cantos of the Orlando Furioso.

DÜPPEL, a fortified village in the province of Schleswig, Prussia, on the coast of the Little Belt. The place is of considerable strategical importance, and has been the scene of some severe struggles between the Danes, to whom it formerly belonged, and the Germans. In 1848 the latter were defeated by the Danes before this place, which, however, was carried by assault the following year. During the years 1860–63 the Danes had strengthened the position by all the means the modern art of fortification put within their power, but it was captured by the Prussians in 1864, after a siege and bombardment which lasted nearly two months.

DUPUIS, Charles François, a member of the French National Institute, was born at Trie le-Château, near Gisors, in 1742, and instructed by his father in mathematics and surveying. The Duke de la Rochefoucault sent him to the Collége d'Harcourt, to pursue his studies; and in his 24th year he was made professor of rhetoric at Lisieux. His intimacy with Lalande, and his own inclination, led him to devote himself particularly to mathematics; the knowledge and the prejudices of that learned man had a great influence on him. His Mémoire sur l'Origine des Constellations et sur l'Explication de la Fable par l'Astronomie (1781) is erudite, but rather sophistical. In 1788 he became a member of the Académie des Inscriptions et Belles-lettres, and went to Paris, where he was named one of the four commissioners of public instruction, to ascertain the resources of all the institutions for education and learning in Paris. As a member of the national convention, he was constant in his support of moderate measures. On this account he was chosen a member of the Council of Five Hundred; and the reputation which he there acquired for activity and information procured him admission into the National Institute. The tribunal and the corps législatif body proposed him as a senator. His work, Origine de tous les Cultes, ou la Réligion universelle (1794, three vols. 4to, with an atlas), is an attempt to discredit all revelation. In this performance he attempted to explain, not only all the mysteries of antiquity, but also the origin of all religious traditions. An abridgment in one volume afterwards followed. His two works on the Pelasgi, their origin in Ethiopia, their spreading over Lybia, Cyrenaica, and the north of Africa, and thence to Spain, Greece, and Italy, attracted great attention. His treatises on the zodiac of Denderah, and on the Phœnix, succeeded. In his last work, Mémoire explicatif du Zodiaque chronologique et mythologique (1806, 4to, engravings), he maintained that the astronomical and religious opinions of the Greeks, Egyptians, Chinese, Persians, and Arabians, had a common origin. He died at his estate near Dijon, 1809, sixty-seven years old, and left in manuscript a work on cosmogony and theogony, the object of which was to confirm the theory he had laid down in his Origine de tous les Cultes. He also endeavoured in this work to explain hieroglyphics.

DUPUYTREN, Guillaume, Baron, a famous French surgeon and anatomist, was born in 1777 at Pierre-Buffière in Haute-Vienne, studied at Paris after 1789, and in 1795 was appointed assistant-dissector to the medical faculty at Montpellier. In 1801 he obtained the situation of overseer of anatomical labours at Paris; and became in 1803 second, and in 1815 first surgeon to the Hôtel Dieu. The professorship of surgery to the medical faculty, conferred upon him in 1813, was exchanged in 1818 for a clinical lectureship in the above hospital. About the same time he obtained a seat in the Academy. In 1823 he was appointed first physician to the king, Louis XVIII., and retained the same situation under Charles X. A stroke of apoplexy had impaired his activity in 1833, and he died at Paris in 1835. He possessed extraordinary acuteness in respect of diagnosis, united with remarkable skill and dexterity in the most dangerous operations, in performing which he had a firmness of nerve which was never shaken. He invented several surgical instruments and modes of operation, and also made some discoveries in pathological anatomy. His imposing personal appearance and powerful intellect gave him a great command over his patients and pupils. His writings relate to some points of surgery and pathological anatomy. Some of his pupils united in publishing his Oral Lectures on Clinical Surgery, delivered at the Hôtel Dieu (Paris, four vols. 1830–34); and his Theory and Practice as to the Treatment of Wounds by Warlike Weapons was published by Paillard and Marx (two vols. 1834).

DUQUESNE, Abraham, a French admiral under Louis XIV., was born at Dieppe, in 1610, and acquired his knowledge of naval affairs under his father, who was an experienced captain. In his seventeenth year he was in the sea-fight off Rochelle, and distinguished himself during and after the year 1637 in the war against Spain. In 1644 he entered the service of Sweden. He was recalled in 1647 to France, and commanded the expedition against Naples. Bordeaux, which had rebelled, he reduced, notwithstanding the assistance afforded it by Spain. In the Sicilian war he thrice defeated the combined fleets of Holland and Spain, under the renowned De Ruyter, who was mortally wounded in the last en-

gagement. After he had reduced Algiers and Genoa to the necessity of supplicating the mercy of Louis XIV., the king conferred upon him the fine estate of Bouchet, and made it a marquisate, with the title of Duquesne. More than this he could not do, because Duquesne was a Protestant. He was, also, the only person exempted from the banishment of his sect, occasioned by the repeal of the edict of Nantes. He died at Paris in 1688. Mildness and modesty tempered his heroic character; and De Ruyter was his model. He left four sons, of whom the most famous, Henry, marquis of Duquesne, was also distinguished as a naval character.

DURA MATER. See BRAIN.

DURANCE, a river, France, which rises in Mount Genèvre, on the west slope of the Cottian Alps; flows circuitously first south-east, then south-west; and after a course of about 180 miles joins the left bank of the Rhone about 4 miles below Avignon. Though a large stream, its current is so rapid, and so much encumbered with debris, that it is nowhere navigable. It often commits great ravages by inundation.

DURANGO, a town in Mexico, capital of the province of New Biscay, or Durango; 335 miles N.W. Mexico; pop. 12,000 to 14,000. It is a bishop's see. The town is situated on an elevation, 6845 feet above the sea. The air is healthy, the surrounding country fertile, producing an abundance of wheat, maize, fruits, &c. The trade is considerable. The prosperity of the town is due in great measure to the discovery of the mines of Guarisamey. In the vicinity is a famous meteoric stone weighing over 40,000 lbs.

DURANTE, FRANCESCO, a celebrated composer, was born in 1684, at Naples, and received his first instruction from the famous Alexander Scarlatti. The fame of Pasquini and Pittoni drew him to Rome, whither he went to perfect himself in the knowledge of counterpoint. He then returned to Naples, as *maestro di capella* (director of church music), and composed, almost exclusively, for the church. In vocal church music he attained a high degree of eminence. He also educated the most celebrated musical masters of the eighteenth century in Naples—Pergolese, Sacchini, Piccini, Guglielmi, Traetta, Jomelli, &c.—and died at Naples, 1755.

DURAZZO (ancient, *Dyrrhachium* or *Epidamnus*), a seaport, European Turkey, province Albania, on the Adriatic, 50 miles south by west of Scutari. It was originally founded by a colony of Greeks from Corcyra, and was long the most important maritime town of Illyria. The expulsion of its aristocracy, B.C. 436, originated the Peloponnesian war. A few columns and marbles are now almost the only remains of the ancient city; but the modern town is strongly fortified, and has a good harbour, with a considerable trade. Pop. about 9000.

DÜREN (ancient, *Marcodurum*), a town, Rhenish Prussia, on the right bank of the Roer and the railway from Aix-la-Chapelle to Cologne, 16 miles east by north of Aix-la-Chapelle. It is of Roman origin, and is mentioned under its ancient name by Tacitus. In 1543, after an obstinate resistance, it was taken and destroyed by the Emperor Charles V., at the head of 50,000 men. The modern town has some handsome churches, a gymnasium, important manufactures of woollens, paper, leather, and hardware; several large distilleries, and an extensive trade. Pop. 12,850.

DÜRER, ALBERT, the greatest of German painters, born at Nürnberg, 1471. His father was a skilful goldsmith of Hungary, and himself instructed his son Albert. Dürer's talent early developed itself; and although he had made great progress in his father's profession by the time he was fifteen, his inclination took a decided turn for painting. Michael Wohlgemuth, then the best painter in Nürnberg, became his instructor in 1486. Having finished his studies he entered upon his travels, and, in 1490, travelled through Germany and Alsace. In 1492 he passed through Colmar and Basel, and in 1494 returned home. Here he executed his masterpiece, a drawing of Orpheus. To please his father, he married the daughter of Hans Frey, a celebrated mechanic; but this connection embittered his life, and perhaps brought him to an early grave. In 1505 he went to Venice to accomplish himself in his art. His abilities excited envy and admiration. He painted the Martyrdom of Bartholomew for St. Mark's church, which painting was purchased by the Emperor Rodolph, and removed to Prague. He also travelled to Bologna, to improve his knowledge of perspective. This journey had no effect upon his style. At his return, in 1507, begins the proper era of his greatness. In 1520 he again visited the Netherlands, probably for amusement only. His fame spread far and wide. Maximilian I. appointed him his court-painter, and Charles V. confirmed him in this office, bestowing upon him, at the same time, the painter's coat of arms, namely, three escutcheons argent in a deep azure field. Dürer was in favour with high and low. All the artists and learned men of his time honoured and loved him, and his early death, in 1528, was greatly lamented. Profound application, great facility in the mechanical part of his art, and a remarkable talent of imitation, were the characteristics of Dürer, and enabled him to exert a great influence on the character of German art. He was the first in Germany who taught the rules of perspective, and of the proportions of the human body, according to mathematical principles. His treatise on proportions was occasioned, it is said, by his studies on the picture of Adam and Eve. He not only made use of the burin, like his predecessors, but was also the inventor of etching, or, if not the inventor, the first who excelled in the art. He invented the method of printing wood-cuts with two colours. His great mathematical knowledge enabled him to form a regular system of rules for drawing and painting. He wrote the first book on fortification, in Germany, and showed how to cast the letters of the alphabet according to fixed proportions, by geometrical calculations. He was particularly eminent as a portrait-painter. He had the power of catching the exact expression of the features, and of delineating all the passions. Among his best engravings in copper are his Fortune, Melancholy, Adam and Eve in Paradise, St. Hubert, St. Jerome, and the Smaller Passion (so called), in sixteen plates. Among his best wood-cuts are the Greater Passion (so called), in thirteen plates; the Smaller Passion, with the frontispiece, thirty-seven pieces; the Revelation of St. John, with the frontispiece, fifteen plates; the Life of Mary, two prints, with the frontispiece. Bartsch, however, has made it more than probable that Dürer himself did not engrave in wood. He only made the drawings on wooden tablets, which were then cut by form-cutters, of whom there were many skilful ones at that time. Dürer has also much merit as a writer. His writings, which were afterwards translated into Latin, French, &c., were published in a collected form at Arnheim, by J. Jansen (1603, folio). See W. B. Scott's Albert Dürer, his Life and Works, and Mrs. Heaton's History of the Life of Albert Dürer (both London, 1869), and Dürer's Briefe Tagebücher und Reime, edited by Tausing (Vienna, 1872).

DURESS, in law, is restraint or compulsion; and it is a general principle, that a contract made under compulsion is not binding; and many acts will be

excused on this ground, which would otherwise be blamable. There may be very different degrees of constraint, from absolute necessity down to a slight motive of fear; and the motives of fear may be of very different strength; for, if a man's life is endangered by his refusal to do an act, the law considers him to be under the highest compulsion, and contracts made under such motives are not binding. Duress may take place in two different ways: 1, by actual imprisonment; and, 2, by threats, *per minas*. If a man be illegally confined to compel him to sign a deed, he may avoid it; but if he be legally imprisoned, and, to gain his liberty, signs a deed or agreement, it will bind him. This is not the duress contemplated by the law. Compulsion will excuse acts, which, done voluntarily and from choice, would be capital crimes; for, by compulsion of an enemy, a man may do acts which, had they been of his free choice, would have been treason, and yet be excused. But the evil committed must be in some proportion to that feared, as a man would not be excused for homicide to avoid even a serious injury to his property. But, in regard to civil transactions, a smaller degree of restraint will be the ground of avoiding an obligation. It has been adjudged that, if one make a deed to avoid the duress done by merely taking his cattle, in other words, to procure their liberation if they were unlawfully detained, the deed may be avoided. A son may allege the duress of a father, a husband that of his wife, a servant that of his master, and a master that of his servant, in avoidance of a deed. A marriage, as well as any other contract, made by one under duress, may, on this ground, be voided.

D'URFEY, THOMAS, a person of some note as a poet and wit in the latter half of the seventeenth century, was a native of Exeter, being descended from a family of French Protestant refugees settled there. He was bred to the legal profession, but soon found a more congenial occupation in writing plays and songs, which, more especially the latter, acquired great popularity, and made him a favourite at the court of Charles II. The bulk of these are extremely licentious, and have become almost forgotten. D'Urfey's name is now principally remembered in connection with his Pills to Purge Melancholy, a collection of songs and ballads, partly his own, and partly gathered from other sources. It was published in 1719 in five volumes. Comparatively few of the pieces are of merit in a literary point of view; and the extreme license pervading them is such as to render them quite unfit at the present day for general perusal. D'Urfey died at an advanced age in 1723.

DURHAM, one of the three English counties called counties *palatine*, the others being Lancashire and Cheshire. These counties were formerly governed by a functionary who had the authority of a count palatine (see PALATINE). The Bishop of Durham was formerly at the head of the administration of justice in this county, but his authority was transferred to the crown by 6 and 7 William IV. cap. xix. Durham is bounded on the E. by the German ocean; on the N. by Northumberland, from which it is divided by the rivers Tyne and Derwent; by Cumberland on the W., from which it is separated by barren hills and moors; and by Yorkshire on the S., the river Tees parting the two counties. The outline of this county forms an irregular triangle, the western angle of which is a mountainous, bare, and barren region, crossed by mountains, to which the name of the Pennine range has been given. This tract, however, is enriched by mines of lead and iron, and it extends along the northern part of the county, till it terminates in the great coal-fields between the Tyne and the Wear. Coal is likewise found on the southern side of the county. In the eastern and central parts are fair and fertile valleys, agreeably varied with hill, dale, arable, and pasture land. The soil in the neighbourhood of the Tees, and on the borders of some other rivers and brooks, is a rich clay or loam; but at a distance from these streams it is of an inferior quality, interspersed with spots of sand and gravel. The total area of the county is 647,592 acres, of which, in 1872, 407,556 acres were under cultivation; 100,526 acres were under corn crops; 33,232 under green crops; 53,367 under clover, sainfoin, and grasses under rotation; and 192,661 acres in permanent pasture. The chief corn crops are wheat and oats; the chief green crops turnips and potatoes. The cattle are abundant, and are justly esteemed both for the dairy and for fattening; the sheep are generally large, and with long wool. The county is rich in minerals, the value of which is much increased by the facilities of transport. Besides three navigable rivers, each with an important town and tolerably good harbour (Stockton, Sunderland, and South Shields) at its mouth, the county is traversed by numerous branches of railway passing through the heart of the mineral fields, and conveying their produce either to the main lines or to the coast, where, in addition to the harbours already mentioned, that of Hartlepool furnishes an important outlet. In connection with the commerce of the county may be noticed its foundries, iron-works, potteries, glass-houses, iron-shipbuilding, engine and machine works, chemical works, and linen and woollen manufactures. For administrative purposes Durham is divided into the four wards of Chester, Darlington, Easington, and Stockton. Ecclesiastically it is in the diocese of its own name and the province of York, and contains sixty parishes. Many of the livings are the most valuable of the kingdom, and much of the land belongs properly to the church. It consists politically of two divisions—a north and a south—each of which sends two members to Parliament. Durham city is the capital, where the assizes and the quarter-sessions are held. Pop. in 1861, 508,666; in 1871, 685,089.

DURHAM (originally *Dunholme*), an ancient and celebrated city and parliamentary borough in England, capital of the county of the same name, situated on the river Wear, about 230 miles north by west of London. It stands on seven eminences, along the summits of which the most of the streets run. The houses are built some of stone some of brick, and many of them are very old, and extremely irregular in form and dimensions. The principal public buildings, exclusive of the ancient castle, the cathedral, and other churches, are the town-hall, a handsome edifice in the Tudor baronial style; the new hall, the county prisons, and a new grammar-school. The educational institutions comprise the university, the grammar-school, the diocesan training-school for school-mistresses, blue-coat, and other schools. There are in the city a mechanics' institute, an athenæum, an infirmary, and a number of minor charities. The only manufactures of any importance carried on are those of carpeting and mustard, for the last of which articles Durham has been for a long time much celebrated. The vicinity abounds in beautiful public walks, commanding a great extent and variety of picturesque scenery. But the great attractions of Durham are its famous cathedral and ancient castle. The former occupies the summit of a peninsula overlooking the Wear on the east and west, and having rapid descents to the river, which are covered with hanging woods and gardens. The aspect of this venerable structure is peculiarly grand and impressive. The general character of the larger portion is Norman, of a very bold style, with inter-

tions in all the English styles. Three magnificent and elaborately ornamented towers spring up from the body of the building, one from the centre, 212 feet high, and two together from the west end, each 143 feet high. The entire length of the edifice is 420 feet. It was founded by William de Carilepho, assisted by Malcolm, king of Scotland, in 1093. The castle, formerly the residence of the bishops, now held in trust by the bishop for the benefit of the University of Durham, stands to the north of the cathedral, on the summit of an artificial mound. It is believed to have been founded by William the Conqueror, but the greater portion of the existing building is supposed to have been erected in 1350. Joseph Butler, author of the Analogy of Revealed Religion, was Bishop of Durham from 1750 till his death in 1752. Durham returns two members to the House of Commons. Pop. of mun. bor. in 1871, 14,406; of parl. bor., 14,833.

DURHAM, UNIVERSITY OF. Although this university is of comparatively recent institution it is long since attention was first called to the inconvenience under which the inhabitants of the north of England laboured in being at so great a distance from the only two English universities then existing, and since a proposal was made to remedy this inconvenience by the establishment of a university at Durham. The first proposal of this nature was made in 1649, during the time of the Commonwealth, and in 1657, under the protectorate of Cromwell, letters patent were granted appropriating the houses of which the dean and prebendaries of Durham had been deprived by the act abolishing deans and chapters, to form buildings for a new university, and conferring an endowment for its support. The Restoration, which followed three years after, prevented these arrangements from being carried out, as the dean and chapter of Durham were then reinstated in their houses and lands, and the funds set apart for the proposed university were withdrawn. Until 1831 the idea of founding a university at Durham was not again entertained, but in that year Bishop Van Mildert, who at that time held the see of Durham, proposed that the scheme should be taken up again, and that funds should be obtained for carrying the scheme into effect by the appropriation of part of the property belonging to the chapter. This was accordingly done. An act of chapter was passed for the purpose in the same year, and in 1832 an act of Parliament was obtained sanctioning the erection of the proposed university, and the application of part of the property of the chapter to its endowment. In 1833 the university was opened, and on the 1st of June, 1837, it was incorporated by royal charter, and all the rights incident to a university so incorporated (and consequently the right of granting degrees in all the faculties) were conferred upon it. As to the endowment of the university, the intentions of Bishop Van Mildert were never fully carried out; but this was provided for by an order in council dated 4th June, 1841, by which the office of warden in the new university was permanently annexed to the deanery of Durham; a canonry in the cathedral was annexed to each of the professors of divinity and Greek; a professor of mathematics and astronomy appointed, and eighteen fellowships were founded, besides six which had previously been founded by the dean and chapter. Certain estates were immediately granted to the university for these purposes, and additional grants have been made at subsequent times.

As at Oxford and Cambridge, the students at Durham University mostly reside within the university buildings, accommodation being provided for them in University College, and in Bishop Hatton's and Bishop Cousin's Hall. In 1870, however, a regulation was passed dispensing with the necessity of residing in any college, hall, or house connected with the university in order to be admitted as a member.

The ordinary management of the university is intrusted, under the Bishop of Durham as visitor, to the dean and chapter of the cathedral as governors, and to the warden, senate, and convocation. The senate consists of the warden, the professors of divinity, Greek, and mathematics, the two proctors, and three other members of convocation. It proposes measures relative to the affairs of the university, but these measures must be presented to the convocation and receive its sanction before they become valid. The convocation, at the establishment of the university, consisted of a number of doctors and masters belonging to the Universities of Oxford and Cambridge, and now includes all persons regularly admitted since the opening of the university to the degrees of Doctor in Divinity, the Civil Law, and Medicine, and to the degree of Master of Arts. It has the right of sanctioning or rejecting any measures proposed by the senate, but it has no power to originate or amend.

The academical year at Durham is divided into three terms—Michaelmas, Epiphany, and Easter. For the degree of B.A., or a license in theology, a residence of two years is necessary; but a licentiate of theology may, after passing the requisite examination, become a graduate after a residence of one year of eight months, and any B.A. of Durham, or higher graduate of any other university in which the examination is of a similar character to that required at Durham, may become a licentiate in theology after a residence of one academical year of six months. No religious test is required from any member of the university unless he is a student in the faculty of theology. There is a school of physical science in connection with the university, the students attending which are, after a residence of two years, admissible to the rank of associates in science. Terms kept by students in this school may, with the consent of the senate, count towards the degree of B.A. In addition to this school of physical science at Durham, there is now a college of physical science in connection with the university at Newcastle-upon-Tyne. It was opened in October, 1871. There is also a college of medicine at Newcastle-upon-Tyne, which is now a college of Durham University. All candidates for a degree of medicine or surgery attending this college must first attend one year in arts at Durham University; but since the erection of this college into a college of Durham University such candidates may reside during this year of their preliminary course either at Durham or Newcastle.

DURIAN, or DURION (*Durio zibethinus*), a fruit-tree pretty generally diffused over the south-east of Asia, and esteemed by those accustomed to it for the delicious flavour of its fruit. The fruit is, however, on a first acquaintance, revolting from its strong smell, which is said to arise from sulphuretted hydrogen. Though of the most nutritious quality and the most agreeable taste, the durian never palls upon the appetite or injures the digestion: its effects are directly opposite. The tree is about the size and somewhat in the form of a pear-tree; but the leaves are shaped like those of the cherry, except that they are entire and smooth at the edges. The flowers are large, and of a yellowish white. The fruit also is large (in some of the species as large as a man's head), and externally it is not unlike the bread-fruit. It has a hard rind, covered with warts and tubercles. When ripe it becomes of a brownish yellow, and opens at the top. It must then be eaten fresh from the tree, as it putrefies in less than twenty-four hours.

The fruit contains five large longitudinal cells, each containing seeds. The seeds are about the size of pigeons' eggs, and there are from one to four in each cell. The remainder of the cells is filled with pulp, which is the delicious part of the fruit.

DÜRKHEIM, a town in Bavaria, in the Palatinate of the Rhine, at the entrance of the valley of the Isenach, 14 miles W.S.W. of Mannheim. It was early walled and fortified, so as to possess considerable strength, and became an object of keen contest during the Thirty Years' war. It was pillaged by the French in 1674 and in 1688. It is well built, possesses a Roman Catholic and two Protestant churches, a Latin and industrial school, glass-works, a paper-mill, and some trade in corn and wine. Its annual sausage market, founded in 1494, is attended by large numbers of people. Dürkheim is well known for its mineral water, which contains principally chlorides of calcium, magnesium, sodium, potassium, and lithium, with some chloride and sulphate of strontium, sulphate of calcium, bromide of magnesium, and traces of arsenic, iron, and ammonia. But the waters are principally known as the source of the saline mixture in which Bunsen and Kirchhoff by spectrum analysis first detected the metals rubidium and cæsium. They are present in very small quantity, so small that by the evaporation of 30,000 lbs. of the water only about 25 grains of chloride of cæsium were obtained; 10,000,000 parts of the water contain about 2 parts of the other element. Pop. 5572.

DURLACH, a town in Baden, in the circle of Middle Rhine, 4 miles E.S.E. of Carlsruhe, at the foot of the Thurmberg, and on the railway to Frankfort. It is an ancient place, and has in its vicinity a ruined castle, which was the cradle of the reigning family of Baden. It is celebrated for its fruit, which is extensively grown in the district. Pop. 6327.

DUROC, MICHEL GÉRARD CHRISTOPHE, Duke of Friuli, a distinguished general under Bonaparte, was born at Pont-à-Mousson, in 1772. He was early destined for the army, and studied at the military school of Pont-à-Mousson. March 1, 1792, he was made lieutenant of artillery. He then served in the republican armies. He served during the first campaign in Italy as aide-de-camp of the general of artillery, Lespinasse. Being subsequently appointed aide-de-camp to General Bonaparte, he soon made himself conspicuous for coolness, courage, and ability. At the passage of the Isonzo, and the capture of Gradisca, in Friuli, he was mentioned as one of the bravest and most able officers. The title of Duke of Friuli, which he received ten years afterwards, was chosen in allusion to his conduct at Isonzo. Duroc followed Bonaparte into Egypt, and distinguished himself also at Jaffa and St. Jean d'Acre, and again in Egypt, at Aboukir. After his return he was sent on missions to Berlin, St. Petersburg, Stockholm, and Copenhagen, and on his return he was promoted to the rank of general of brigade. When the first consul assumed the title of emperor he made Duroc grand-marshal of the palace. The courtier and favourite never ceased to be a soldier. He accompanied Napoleon in all his campaigns. In 1805 he was charged with a mission to the Prussian court, at the time when Napoleon was marching against Vienna. He rejoined the army previously to the battle of Austerlitz, and took the command of the division of grenadiers, which had been left without a head in consequence of the wound of Oudinot. During the campaign in Prussia, in 1806, Duroc was commissioned to sign the treaty of peace with the King of Saxony; and at a later period he was the principal negotiator of the armistice which preceded the Peace of Tilsit. He followed Napoleon to Spain, and during the campaign of Wagram. At the battle of Esslingen he arranged and directed his batteries in such a way as to arrest the progress of the enemy in a decisive movement. On the return of Napoleon from the Russian campaign, in 1812, Duroc reorganized the imperial guard, which at this time, and on several other occasions, he commanded. Before his last departure for the army he was appointed senator. Duroc finally followed Napoleon to Germany, in 1813, and was killed, May 23, at the close of the battle of Bautzen, by a ball, which also killed General Kirschner, with whom he was conversing behind the emperor.

DURRA. See MILLET.

DURRA, ZARRAH, or ZURRAH, a large brackish lake in Afghanistan, in the province of Seistan; lat. 31° 30′ N.; lon. 61° 30′ E.; about 160 miles in circumference, and containing an island on which is a stronghold called the fort of Rustain or Rustan, in which the chiefs of Seistan used to take refuge when their country was invaded. The shores are overgrown to a considerable distance with rushes and reeds, interspersed with pools of standing water.

DÜRRENSTEIN, a village in Lower Austria, picturesquely situated on the left bank of the Danube, 41 miles west by north of Vienna. It is celebrated for its feudal castle, the ruins of which occupy the summit of a lofty and precipitous rock. In this castle Richard Cœur-de-Lion was treacherously detained on his return from Palestine in 1192, by Duke Leopold of Austria.

DUSCHAN, STEPHEN, Prince of Servia, of the house of Nemanja (which obtained the sovereignty in 1192), and hence sometimes known in history by the name of Nemanjitch IX., reigned from 1336 to 1356, and both as a ruler, warrior, and legislator, is one of the most celebrated characters in the ancient history of Servia. In his day he was the most powerful prince in the south-east of Europe. Following the policy of his predecessors, which was always to adhere to that party in the Greek Empire which was opposed to the court, he was the means of seating the ambitious pretender, John Cantacuzenus, on the Greek throne, and thereby obtained from him many important towns and lands. Soon after, involved in a quarrel with him, he conquered Macedonia, defeated the infidels whom the emperor had called to his aid, repulsed with like success the Hungarians who were advancing under Louis I., took Belgrade, rescued Bosnia from a refractory ban, and added it to his own dominions. He also, in 1347, caused himself to be acknowledged as protector of the Republic of Ragusa, and brought a great part of Albania under his jurisdiction. His dependents also extended their authority over the whole basins of the Wardar and Maritza, as also Bulgaria, which might likewise be considered as a province of his kingdom. In the possession of such extensive power he assumed the proud title of czar, and called himself Emperor of the Romans. On his coins he is represented holding a globe with a cross over it. In order to withdraw the spiritual power from all foreign influence, he caused his clergy, at a synod held at Pheræ, to make choice of a particular patriarch for their head. He also devoted much attention to internal improvements. Agriculture, mining, and trade flourished; churches, monasteries, castles, and fortresses arose under the hands of native architects; and profane learning took its place as the handmaid of sacred literature. A code of laws which he published gives important information in regard to the state of society within his dominions. It is characterized by its noble and humane spirit, and in connection with the Prawda Ruskaja of the Russian Prince Jaroslav, and the Wislicz sta-

tute of the Polish King Casimir, forms the groundwork and chief source of national Slavonic law.

DUSSEK, JOHANN LUDWIG, one of the best players on the pianoforte and composers for that instrument, born at Czaslau, in Bohemia, in 1761, distinguished himself first as a player on the harmonica. He proceeded in 1786 to Paris, and at a later period to London, where, in 1796, in connection with his father-in-law, Conchettini, he established a music-shop. Being unfortunate in business he secretly left England and went first to Hamburg, and afterwards to Berlin, where he became the confidant of Prince Louis. After the death of the prince he obtained an establishment with the Prince of Isenburg, and the following year with Talleyrand, whom he accompanied to Paris, where he died in 1812. The number of his pieces is very large, and they were almost all very favourably received. He is most generally known by a work which he published in concert with Pleyel, entitled, A New Method for the Piano, and more especially for Fingering.

DÜSSELDORF, a town in Prussia, capital of the government of the same name, in the Rhenish province, beautifully situated among villas and gardens, on the right bank of the Rhine, here crossed by a bridge of boats, at the confluence of the Düssel, and on the railway from Elberfeld, 22 miles N.N.W. Cologne. Its ramparts have been thrown down and converted into promenades, and so many improvements have been made upon it within the present century, that it now ranks as one of the handsomest towns in the valley of the Rhine. It consists of three parts—the Altstadt, the Karlstadt, and the Neustadt. Of these the Altstadt is the least prepossessing, and the Neustadt the most elegant. The principal edifices are St. Lambert's church, in the centre of an irregular open space in the north-west part of the town, near the Rhine, adorned with a beautiful monument of Duke John William IV. and his consort, in white marble, and with several fine paintings; St. Andrew's or the Hof church; the Franciscan or Maximilian church, with a fine bronze altar table and a large picture by Damian; the old electoral palace, which was thrown in ruins in the bombardment of the town by the French in 1795, but is now restored and occupied by the Academy of Painting; and the town-house, an ancient and venerable structure. Among the public institutions, particular notice is due to the Academy of Art, founded, 1767, by the Elector Theodore, renovated, in 1821, by King Frederick William, and afterwards directed by Cornelius and Schadow. It has the honour of having founded a school of painting, which takes the name of Düsseldorf, and has a great number of young painters in training, many of them of high promise. Several branches of manufacture are carried on, particularly that of liqueurs, and the trade is large and rapidly increasing. After being the capital of the duchy of Juliers and Berg, Düsseldorf passed under the rule of the counts palatine of Neuburg, and then became the residence of the Elector-palatine John William. It was taken by the French in 1795, restored to Bavaria by the Treaty of Lunéville in 1801, in 1806 became the capital of the grand-duchy of Berg, with which it passed to Prussia in 1815. Pop. in 1871, 69,351.—The government of Düsseldorf has an area of 2111 square miles, and in 1871 the population amounted to 1,328,065.

DUTCH AUCTION, a kind of auction in which articles are put up for sale at a price above their real value, and above the value at which they are expected to be sold, and the price is lowered until a bid is made for the articles.

DUTCH GOLD, copper gilt beaten out so as to resemble gold-leaf, or brass or bronze beaten out in the same way. It is used for cheap decorations or toys, &c.

DUTCH LANGUAGE, LITERATURE, SCHOOLS OF ART, &c. See NETHERLANDS.

DUTCH LIQUID, an oily fluid first prepared by the Dutch chemists Bondt, Lauwerenburgh, Deimann, and Paets van Troostwyk, by causing chlorine gas and heavy carburetted hydrogen to combine. In consequence of its forming this oil they called the heavy carburetted hydrogen 'oily' gas, but Fourcroy afterwards changed it to olefiant or oil-forming gas.

DUTCH METAL, an alloy containing 84·5–84·7 p. ct. of copper and 15·5–15·3 p. ct. of zinc, with a fine golden-yellow colour, ductile, malleable, and tenacious. When beaten out by a process analogous to that for gold-leaf, until the sheets are less than 1–50,000th part of an inch thick, it constitutes Dutch leaf or Dutch foil, and is used instead of gold-leaf for ornamental purposes. As it dissolves in nitric acid it is readily distinguished from true gold-leaf. The scraps and parings from Dutch leaf are utilized by grinding them with oil or honey, or some convenient medium, and thus they constitute bronze powders.

DUTCH PINK, a bright yellow colour used in distemper, for staining paper-hangings, and for other ordinary purposes.

DUTCH RUSH, a name given to the *Equisetum hiemale*. See EQUISETUM.

DUTENS, LOUIS, born at Tours, 1730, of Protestant parents; died in London, 1812. At the time of his death, which happened at an advanced age, he was historiographer to the King of England, fellow of the Royal Society of London, and member of the Paris Academy of Inscriptions. Being convinced, by some unsuccessful attempts in tragedy, that he had no genius for poetry, he obtained, with some difficulty, the place of a tutor. He became the friend of many distinguished men, who enriched him with pensions, benefices, and legacies. He was three times British *chargé d'affaires* to Turin, travelled through Europe several times, and formed an acquaintance with many of the learned men in different parts of the Continent. He published the works of Leibnitz, at Geneva, in six vols., not quite complete. The preface to the mathematical part is highly esteemed by mathematicians. In general, he was an opponent of the French philosophers, and attacked them on every occasion. In his Œuvres mêlées (London, four vols.) may be found his Logique ou l'Art de raisonner. His Histoire de ce qui s'est passé pour le Rétablissement d'une Régence en Angleterre (1789) has historical interest. Dutens also composed a work, rather alien from his common pursuits, on the genealogy of the heroes of romance. Three volumes of Mémoires d'un Voyageur qui se repose (Paris, 1806) were received with general approbation.

DUTROCHET, RENÉ JOACHIM HENRI, a French physiologist, born in Poitou in 1776; died at Paris in 1847. His family having been ruined by the revolution, he determined to apply himself to the study of medicine, and came to Paris for the purpose. Having obtained his degree in 1806, he was appointed doctor in the army; and in 1808 and 1809, during the campaign in Spain, he was attached to the person of Joseph Bonaparte as medical attendant. Being appointed head of the medical hospital at Burgos, he showed great courage and devotion during an epidemic which raged among the troops, but was himself at last attacked by typhus fever, after recovering from which he returned to France, and retired to the estate of Châteaurenault, where he chiefly resided during the remainder of his life. During this period he devoted himself exclusively to physical and physiological studies, and published a

number of original dissertations on the egg before laying, on the gradual increase of the yellow and the simultaneous diminution of the albumen, on the structure and growth of feathers, on the envelopes of the fœtus in the Mammiferæ, and of the human fœtus, &c. &c. He was appointed correspondent of the Academy of Sciences in 1819, associate of the Academy of Medicine in 1824, and member of the Institute in 1831. His chief works have been published in a collective form with the title Mémoire pour servir à l'Histoire anatomique et physiologique des Végétaux et des Animaux (1837, two vols.) This collection includes, among other things, the following works that had previously been published separately: Essai sur une nouvelle Théorie de la Voix (1806); Théorie de l'Habitude et des Sympathies (1810); Récherches sur l'Endosmose et l'Exosmose (1828). He afterwards published Récherches physiques sur la Force épiploique (1042–43).

DUTTEEAH, or DATTIYA, a town in Hindustan, capital of a state of the same name, on the route from Agra to Saugor, between parallel low and rocky hills, 110 miles S. by E. Agra. It consists of narrow winding streets, in which, however, many of the houses are large and substantial. The rajah's palace is situated within a well laid out pleasure-ground of about 10 acres, inclosed by a lofty wall, with embattled towers at each of its four corners. There are two other palaces, one within the town, and the other outside, but both untenanted. Pop. estimated at from 40,000 to 50,000.

DUVAL, VALLENTINE JAMERAY, librarian of the Emperor Francis I., born in 1695, was the son of a poor peasant in the village of Artonay, in Champagne. An epitome of arithmetic, which fell into his hands, highly interested his youthful mind. In the solitude of a forest he received his first ideas of astronomy and geography. In order to procure the means of educating himself he killed game, and in a few months the proceeds of his toils furnished him with a little stock of money. From this situation he was raised by the Duke of Lorraine, who appointed him his librarian, and also professor of history at the Academy of Lunéville. When Lorraine was ceded to France, he removed, with the library under his care, to Florence, where he stayed ten years. The Emperor Francis invited him to Vienna, to form a collection of medals. Here he died in 1775. With all his learning, Duval was exceedingly modest. His Œuvres, précédées de Mém. sur sa Vie, were published at St. Petersburg, Basel, and Strasburg, in the year 1784, in two volumes quarto.

DVINA, NORTHERN, a river in Russia, formed in the government Wologda by the junction of the Suchona and Vitchegda; flows N.N.W., and, after a course of between 300 and 400 miles, falls into the White Sea 30 miles below Archangel, by several mouths, which form a number of islands. By means of canals connecting the Suchona with the Neva, and the Vitchegda with the Kama, a navigable communication is opened between the White Sea, the Baltic, the Black Sea, and the Caspian.

DVINA, WESTERN. See DÜNA.

DWALE, a name of the deadly nightshade. See NIGHTSHADE.

DWARFED TREES. These form a favourite ornament for gardens among the Japanese and Chinese, who adopt a peculiar method of dwarfing. They choose some fruit or flower bearing branch of any tree of which they wish to produce a dwarf specimen, and cutting off a ring of the bark, surround the stripped part with clay, which they keep moist by means of a covering of moss, which is watered when it becomes dry. After a period, varying in different trees from about three months to two years, roots are sent out by the branch into the clay. The branch is then cut off below these artificial roots, and planted in a poor soil, where it is kept scantily supplied with water. In this state the tree will remain for years, with vitality enough to produce leaves and even flowers annually, but never producing any but abortive shoots. Another method is to plant trees in flower-pots with a shallow covering of soil, supplying them, as in the former case, very sparingly with water, and pinching off all the strongest shoots. It may also be effected by grafting on slow-growing stocks.

DWARFS. The term *dwarf* is a vague one, as we cannot say how small a person must be to be so called. Among the various causes which conduce to dwarf the human figure, some belong to the mother, others to individual constitution, and others are external. Insufficient nourishment of the fœtus, double pregnancy, and other causes before birth, sometimes bring about this result; and after birth, rickets, bad nourishment, privations, the abuse of certain aliments, especially of alcoholic liquors while very young, also excessive cold or heat, bodily exertions begun at too early a period of life, bad dwellings, destitution, &c., all tend to produce the same effect. The Romans used dwarfs for several purposes; sometimes in gladiatorial exhibitions, on account of the ridiculous contrast which they afforded to their opponents. Towards the end of the middle ages, and even in some countries as late as the beginning of the last century, dwarfs were a fashionable appendage to the courts of European princes, and the families of the nobles. Who does not recollect the numerous pictures of those times, with a negro or a dwarf in the background? They seem to have been great favourites with the ladies of the family. They were sometimes also used as fools. Peter the Great carried this fancy for dwarfs to a great extent. He assembled individuals of this kind from all parts of his empire, and ordered the famous marriage of the dwarfs. At the court of Constantinople a number of dwarfs are always maintained as pages. Those who happen to be at the same time deaf and dumb, and have been mutilated, are particularly valued, and reserved for the sultan. Amongst the most celebrated dwarfs, the following may be mentioned:—Jeffery Hudson, the favourite dwarf of Charles I., who at the age of thirty is said to have been only 18 inches high, though he afterwards grew to 3 feet 9 inches. Count Boruslavski, a Polish gentleman, who died in 1837; his height at twenty-five was 35 inches; he was a man of considerable intelligence and accomplishments, and wrote his memoirs, which were published in London in 1788: Bébé, the celebrated dwarf of Stanislas of Poland; his height was 33 inches: Wybrand Lolkes, a Dutch dwarf, born in 1730, who when sixty years of age was only 27 inches high: Madame Teresia, 'The Corsican Fairy,' born in 1743, remarkable for beauty and *esprit*, 34 inches high.

DWIGHT, TIMOTHY, an eminent American divine, was born at Northampton, in Massachusetts, May 14, 1752. In 1769 he graduated at Yale College, and in 1771 became a tutor there, a position which he continued to occupy for six years. In 1777 he was licensed as a preacher by a committee of the northern association, in his native county of Hampshire, and soon after was appointed a chaplain in the army. The circumstance of his father's death, in October, 1778, obliged him to resign his office, in order to assist his mother in the support and education of her family. He accordingly removed his own family to Northampton, where he resided five years, labouring on the farm through the week, preaching to different congregations in the neighbourhood on Sundays. In 1783 he was ordained minister of Greenfield, a parish

in the town of Fairfield, in Connecticut. Immediately upon settling at this place he opened an academy, which soon acquired a reputation then unequalled in America. In the year 1787 the College of Princeton, New Jersey, conferred upon him the degree of D.D. On the death of the Rev. Dr. Styles, in 1795, Dr. Dwight was elected president of Yale College, which was in a depressed state. His reputation soon brought to the college a great accession of students. When he entered the office of president the professorship of theology was vacant, and several fruitless attempts having been made to fill it, he engaged to perform the duties. He was annually elected to this chair for ten successive years, at the end of which period the appointment was made permanent, and he continued to fill it for the remainder of his life. In 1810 he received the degree of LL.D. from Harvard College. Dr. Dwight died January 11, 1817. The chief works of Dr. Dwight are his Theology Explained and Defended, published the year after his death; and Travels in New England and New York (four vols. 1821), being notes of annual summer excursions he was in the habit of making in the latter years of his life. He was also the author of two poems of no great celebrity, the Conquest of Canaan and Greenfield Hill, besides numerous unimportant works, consisting of dissertations, occasional sermons, &c.

DYAKS. See BORNEO.

DYCE, ALEXANDER, a well-known antiquarian writer and commentator on Shakspeare, born at Edinburgh, June 30, 1798; died May 15, 1869. He was educated first at the High School of Edinburgh, afterwards at Oxford; and taking orders, acted as curate first at Lanteglos, in Cornwall, and then at Nayland, in Suffolk, till 1827, when he settled in London, where the most of his life was passed. He was first brought into notice by his Specimens of the British Poetesses, which was followed by editions of the poetical and dramatic works of Collins, George Peele, Robert Greene, Webster, Middleton, Beaumont and Fletcher, Marlowe, Shirley, Skelton, Wotton, and Drayton, all of which were accompanied by notes and biographies of the authors. He also prepared for Pickering's collection, called the Aldine Poets, editions of the works of Pope, Collins, Beattie, and Akenside; and for the Shakspeare Society the old tragedies of Timon and Sir Thomas More. In 1840 he founded, in conjunction with Collier, Halliwell, and Wright, the Percy Society, for the publication of ancient comedies and ballads. His chief labours, however, were devoted to Shakspeare, an edition of whose works he published in six vols. (London, 1853–58; second edition, greatly improved, 1864–66). In his Remarks on Collier's and Knight's Editions of Shakspeare (London, 1844), he pointed out several errors into which the modern commentators on Shakspeare had fallen; and in another work, entitled A few Notes on Shakspeare (London, 1853), he pronounced very strongly against the emendations of the text of Shakspeare published by Collier, and maintained by him to belong to the first half of the seventeenth century. The last work he was engaged on was an edition of Ford's works, which was published in three vols. only a month before his death.

DYCE, WILLIAM, a painter, born at Aberdeen in 1806; died at Streatham, Feb. 14, 1864. He graduated as M.A. at Aberdeen University in 1822, after which he commenced his art studies at the Royal Scottish Academy at Edinburgh. He afterwards went to Rome to extend his studies, and on his return to his own country he settled at Edinburgh, where he soon became known as a portrait-painter and as a distinguished contributor to the exhibition of the Royal Scottish Academy. The first picture he exhibited was Bacchus nursed by the Nymphs, a subject already treated by Howard. After remaining several years in Edinburgh, interrupted only by a second visit to Rome, which he made after the exhibition of his first picture, he settled in London, and began to contribute to the Royal Academy exhibition. In 1836 he contributed The Descent of Venus, the subject of which was taken from Ben Jonson's Triumph of Love; and in 1839, St. Dunstan separating Edwy and Elgiva. In 1842 he was appointed superintendent and secretary of the art schools in connection with the board of trade, but he resigned this office in 1844. When the decoration of the interior of the new houses of Parliament was made a subject of competition, Dyce exhibited his talents in a new light. His cartoons, manifesting a profound study of the Italian masters of the fifteenth century, were approved by the judges, and to him was confided the task of producing two large frescoes, The Consecration of Archbishop Parker and The Baptism of Ethelbert. It was then that he was commissioned by the prince consort to decorate his summer apartments at Buckingham Palace. Dyce was made a Royal Academician in 1848. Among the other pictures contributed by this artist to the Royal Academy exhibitions are: Virgin and Child (1846), Omnia Vanitas (1849), Meeting of Jacob and Rachel (1850), King Lear and the Fool in the Storm (1851), and John Leading Home the Virgin (1860).

DYEING is a chemical art, and 'consists in fixing upon cloths of various kinds any colour which may be desired, in such a manner as that they shall not easily undergo any alteration by the agents to which the cloth is ordinarily exposed. The chief materials of stuff to be dyed are wool, silk, cotton, and linen; of which the former two are more easily dyed than the latter. Wool, in its preparation for dyeing, requires to be cleansed, by scouring, from a fatty substance called the *yolk*, which is contained in the fleece. This is done by means of a weak alkaline solution, which converts the yolk into soap. Putrid urine is commonly employed, on account of its cheapness, the ammonia it contains being sufficient to remove the grease. Silk, when taken from the cocoon, is covered with a kind of varnish, which, because it does not easily yield either to water or alcohol, requires also the aid of a slight portion of alkali. Much care is necessary, however, in this operation, since the silk itself is liable to be corroded and discoloured. Fine soap is commonly used, but even this is said to be detrimental; and the white China silk, which is supposed to be prepared without soap, has a lustre superior to the European. The preliminary process of washing is intended to render the stuff to be dyed as clear as possible, in order that the aqueous fluid to be afterwards applied may be imbibed, and its contents adhere to the minute internal surfaces.'

Another preparation, and one which constitutes in reality an important part of the dyeing process, consists in applying to the stuff a material which adheres to it, and afterwards the desired colour is obtained by the application of another substance. We might dye a piece of cotton black by immersing it at once in ink; but the colour would be neither good nor durable, because the particles of precipitated matter are not sufficiently comminuted to enter the cotton or to adhere to it firmly. But if the cotton be soaked in an infusion of galls, then dried, and afterwards immersed in a solution of sulphate of iron, the acid of galls being everywhere diffused through the fabric, it will receive the particles of oxide of iron at the very instant of their transition from the fluid to the solid state; by which means a perfect covering of the black, inky matter will be applied in close con-

tact with the surface of the most minute fibres of the cotton.

The name of *mordant* is applied to those substances which unite with the different stuffs, and augment their affinity for the various colouring matters. There exists a great number of mordants; some, however, are very feeble in their activity, while others are attended with too much expense for common stuffs; some alter the colours with which they are intended to combine, or modify their shades: hence it results that there are but a small number which can be employed. These are alum, acetate of alumina, chloride of tin, and salts of iron. The mordant is always dissolved in water, into which the stuffs to be dyed are plunged. If the mordant be universally applied over the whole piece of goods, and this be afterwards immersed in the dye, it will receive a tinge over all its surface; but if it be applied only in parts, the dye will strike in those parts only. The former process constitutes the art of *dyeing*, properly so called; and the latter the art of printing woollens, cottons, or linens, called *calico-printing*. In the art of printing piece goods, the mordant is usually mixed with gum or starch, and applied by means of blocks or wooden engravings, or rollers in relief, or of copper plates, and the colours are brought out by immersion in vessels filled with suitable compositions. The latter fluids are termed baths.

The following are the processes adopted when alum is the mordant employed:—1. *Alum mordant for silk.* In water containing the sixtieth part of its weight of alum, at the ordinary temperature of the air, the silk is plunged, and allowed to remain for twenty-four hours, when it is withdrawn, drained, and washed. If the liquid is warmed, it is found that the silk absorbs less of the mordant, and that, of course, it combines less easily with the colouring matter, besides losing in part its natural gloss. 2. *Alum mordant for wool.* When it is wished to combine wool with this mordant, after its cleansing has been effected it is plunged into a boiling solution, composed of 800 or 900 parts of water and twenty-five of alum, where it is allowed to remain during two hours, when it is taken out, suffered to drain, and washed. Frequently a little cream of tartar is added in this process. 3. *Alum mordant for cotton, hemp, and flax.* This operation is effected by plunging the body to be imbued with this mordant into water slightly warmed, and which contains one quarter of its weight of alum, and leaving it for twenty-four hours at the common temperature of the air, when it is withdrawn, washed, and dried. The cotton will be sufficiently imbued with the mordant if allowed to remain in the solution only seven or eight minutes—pressing it a little (without twisting it, however) on taking it out, and not immersing it in the colouring bath until twelve or fifteen hours after. In all alum mordants for wool the alum of commerce may be employed; but when silk or cotton is to be dyed, especially if the colours are bright, it is necessary to make use of the alum of Rome, or of that which is equally pure; that is to say, of alum which does not contain above 1-500th of its weight of sulphate of iron: otherwise there will be a great quantity of oxide of iron adhering to the fabric, which will affect the shade we desire to obtain. The colouring matters to be transferred to the various stuffs are either soluble or insoluble in water. When they are soluble in water, which is most generally the case, they are dissolved in it at a boiling temperature; and the material to be dyed, after having been duly prepared, and impregnated with the mordant, is plunged into it, where it is allowed to remain for a certain time, and at a temperature varying with the nature of the stuff. When, on the contrary, the colouring matter is insoluble in water, its solution is effected in some other fluid, and the article to be coloured (prepared as in the former case, with the exception that the application of the mordant is omitted) is immersed, and the colouring matter is precipitated by the addition of a third body.

Silks are dyed at a temperature which is gradually increased from 86° to 175° Fahr. If the bath is heated above 86° at the commencement of the process, the effect of the mordant is diminished, and the desired shades of colour will not be produced. For the same reason, in dyeing hemp and flax, the temperature should not exceed 97° Fahr. Cotton and woollens may be dyed at a boiling heat. Various mechanical contrivances are made use of in immersing the different materials to be dyed into the colouring solution, so as to cause all their parts to be equally affected at the same time. As soon as they are withdrawn from the colouring bath they are washed in a large quantity of water, in order to deprive them of those particles of colouring matter that are merely superficial.

The following are the dye-stuffs used for producing *fast* colours:—1. *Black.* The cloth is impregnated with acetate of iron (iron liquor), and dyed in a bath of madder and logwood. 2. *Purple.* The preceding mordant, diluted with the same dyeing bath. 3. *Crimson.* The mordant for purple, united with a portion of acetate of alumina, or red mordant, and the above bath. 4. *Red.* Acetate of alumina is the mordant (see ALUMINA), and madder is the dye-stuff. 5. *Pale red*, of different shades. The preceding mordant, diluted with water, and a weak madder bath. 6. *Brown of Pampadour.* A mixed mordant, containing a somewhat larger proportion of the red than of the black, and the dye of madder. 7. *Orange.* The red mordant, and a bath, first of madder and then of quercitron. 8. *Yellow.* A strong red mordant and the quercitron bath, the temperature of which should be considerably under the boiling-point of water. 9. *Blue.* Indigo, rendered soluble and greenish-yellow coloured by potash and orpiment. It recovers its blue colour by exposure to air, and becomes firmly fixed upon the cloth. An indigo vat is also made by diffusing indigo in water with quicklime and copperas. These substances are supposed to act by deoxidizing indigo, and at the same time rendering it soluble. 10. *Golden dye.* The cloth is immersed alternately in a solution of copperas and lime-water. The protoxide of iron, precipitated on the fibre, soon passes, by absorption of atmospheric oxygen, into the golden coloured peroxide. 11. *Buff.* The preceding substances, in a more dilute state. 12. *Blue vat*, in which white spots are left on a blue ground of cloth, is made by applying to these points a paste, composed of a solution of sulphate of copper and pipe-clay, and, after they are dried, immersing it, stretched on frames, for a definite number of minutes in the yellowish-green vat, of one part of indigo, two of copperas, and two of lime with water. 13. *Green.* Cloth dyed blue, and well washed, is imbued with the acetate of alumina, dried, and subjected to the quercitron bath. In the above cases, under 9, the cloth, after receiving the mordant paste, is dried and put through a mixture of cow-dung and warm water.

The foregoing colours are also produced from decoctions of the different colouring woods; but as they possess but little fixity when thus formed, they are denominated the *fugitive* colours. 1. *Red* is made from Brazil-wood and peach-wood. 2. *Black.* A strong extract of galls and pernitrate of iron. 3. *Purple.* Extract of logwood and the pernitrate of iron. 4. *Yellow.* Extract of quercitron bark, or French berries, and nitro-muriate of tin. 5. *Blue.*

Prussian blue and solution of tin. Fugitive colours are thickened with gum tragacanth, and are sometimes sent to market without being washed. Besides these we must not forget the coal-tar colours now employed to produce almost every shade the dyer requires. They are, besides, much easier to work, and take less time; but they are not so permanent, and the colours are still expensive.

DYER, JOHN, an agreeable poet of the secondary class, was born at Aberglasney, in Carmarthenshire, in 1700, and educated at Westminster School. Being left, by the death of his father, at liberty to follow his own inclination, he became a pupil to Richardson the painter, and travelled through Wales as an itinerant artist, but never seems to have gained any distinction in that capacity. In 1727 he made himself known as a poet by the publication of his celebrated Grongar Hill. The intermixture of moral reflections, introduced in an easy manner, with the description of rural scenery, has rendered this poem highly and deservedly popular. After the publication of Grongar Hill he went to Rome for professional improvement, and published in 1740 a poem in blank verse under the title of the Ruins of Rome. Not appearing likely to succeed in his profession, he was recommended to take orders, and was accordingly ordained by Dr. Thomas, bishop of Lincoln. He then married, and retired to a small living in Leicestershire, which he soon afterwards exchanged for another in Lincolnshire, to which a second was subsequently added. In 1757 he published his largest poem, the Fleece, in five books, a very ingenious production. He died in 1758. His poems, which comprise a few more pieces than those already mentioned, were published in one vol. 8vo, 1761.

DYING DECLARATION, a deposition made by one who is in prospect of death. Such declarations are admitted as evidence both in England and Scotland. It is allowable for a witness to give parole evidence of a dying declaration, but more weight is attached to it when it was taken down in presence of witnesses. It is not necessary, however, to observe all the formalities which are required in the authentication of the declaration of a prisoner when a dying declaration is committed to paper. Before dying declarations can be admitted as evidence against a prisoner it is necessary to prove that the deceased person at the time of making the declaration really apprehended impending, though perhaps not immediate dissolution. Act 30 and 31 Vict. cap. xxxv. sec. 6 and 7, contain enactments with regard to dying declarations, and makes provision, among other things, for prisoners being present when they are made.

DYKE. See DIKE.

DYKE, a term applied by geologists to masses, generally of crystalline rock, which are often found intersecting other strata in the manner of huge walls, of greater or less thickness. They are very common in coal-fields, and often give very visible indication of their volcanic origin, or at least of their having once been rendered fluid by heat, and then either ejected from below or injected from above, so as to fill up fissures in the strata. A coal seam in the vicinity of a dyke is often as completely carbonized as if it had been placed in a coke furnace. Its level also is usually changed, the seam, if continued at all on the other side of the dyke, being found either much higher or much lower than before.

DYNAMETER, measurer of increase, *augomètre;* an instrument for measuring the magnifying power of telescopes. It consists of a small tube, with a transparent plate, exactly divided, which is fixed to the tube of a telescope, in order to measure exactly the diameter of the distinct image of the eye-glass.

DYNAMIC AND ATOMIC THEORIES, the names given to two celebrated systems explanatory of the essential constitution of matter. In the dynamic theory every body is considered as a space filled with continuous matter; porosity then becomes an accidental quality, but compressibility and dilatability essential properties. The state of a body depends entirely on certain attracting and repelling forces; and its volumes must change with every change in the relative proportions of these forces. All the varieties of matter are explained by supposing the existence of certain primitive simple substances, the different combinations of which produce all bodies. When two substances combine chemically they must be considered, on this system, to penetrate each other mutually. The partisans of the atomic theory suppose every body to be composed of indivisible and impenetrable particles, which they term *atoms*. These are almost infinitely small, with void spaces between them, so that this theory makes porosity essential to matter. The atoms are not in contact, but are kept in their relative positions, at certain distances, by certain attractive and repulsive forces; from whence it arises, that, in the volume of each body, there is much more void space than matter. On this system the diversities in bodies may be explained either by an essential difference in the atoms themselves, or by a difference in their form, size, position, and distance. When two substances combine chemically the atoms of one penetrate the interstices of the other, and the atoms of the two combine so intimately that they become in a manner new sorts of constituent particles, excepting that they are not simple, but compound.

DYNAMICS, the science which investigates the action of force. This definition is in accordance with the usage of Newton, and with the derivation of the word, which comes from the Greek *dunamis*. It is also in agreement with the best and latest writers of the day. It will therefore, no doubt, soon be used in *popular* language too, though, as will be immediately explained, this is not exactly the case at present.

Force, when it acts on matter, is recognized as acting in two ways: first, so as to compel rest, or to prevent change of motion, and secondly, so as to cause or to change motion. Hence the science of dynamics is divided into two branches, to which the names *statics* and *kinetics* are respectively given. There is a branch, properly speaking, of pure mathematics, which treats of the mere circumstances of motion without considering the forces which produce it. This subject is always considered in connection with the science of dynamics, and the name *kinematics* is given to it. For some time past, however, it has been the custom to give to the science of force the name *mechanics*, a use quite contrary to that of Newton, with whom mechanics meant the science of *machinery*. Under this system, the branch which treats of force applied so as to compel rest or prevent change of motion was called *statics:* but the branch of the science which considers force applied so as to cause or change motion was called *dynamics*, and no special name was given to that which is now called kinematics, the subject being treated under the last-mentioned head. Since, as we have indicated above, this usage still exists in *popular* language, we have adhered to it in this work: the reader is therefore referred to the article MECHANICS for information on the *science of force*.

DYNAMITE, an explosive substance patented by A. Nobel in 1867. It consists of a siliceous earth from Oberlohe in Hanover known as *Kieselguhr*, impregnated with 75 per cent. of nitro-glycerine, the object of the mixture being to facilitate the carriage and use of that substance by diminishing its susceptibility to slight shock while not destroying its explosive force. The siliceous matter is of diatomaceous origin,

it is extremely friable and porous, and has a considerable absorbent power. Dynamite is prepared in a porcelain vessel in which a mixture of 20–25 parts of the siliceous matter in the finest powder is stirred with 70–75 parts of nitro-glycerine until the mass is quite uniform and has the appearance of raw sugar. The mixture remains without change for any length of time, and it is not affected by damp. Its properties have been often exhibited publicly by severe experiments. From these it appears that it is not affected by mere shock, but requires to be exploded by a specially arranged fulminating cap. Thrown into a fire it burns with a bright flame, but without explosion. Its disruptive effect upon tough timber, blocks of granite, and slabs of wrought iron is most intense, and is estimated at about eight times that of gunpowder, being besides more concentrated. For blasting it is of course much superior: it requires less labour in making cavities for the charge, it is not affected by wet, and it gives off no smoke, which is of great importance in mines.

As the infusorial siliceous powder is not easily obtained, various substitutes have been adopted, such as charcoal, sand, and saw-dust. The proportions also are sometimes varied; thus the dynamite made in Paris during the siege consisted of 25 per cent. of nitro-glycerine and 75 per cent. of burned clay from the glass and brick furnaces. It was used with great effect in breaking up accumulations of ice on the Seine. See NITRO-GLYCERINE.

DYNAMOMETER. Instruments for measuring the relative strength of men and animals, as also the force of machinery, are so called. When the pull upon a draught implement, as a plough, is the point to be determined, the dynamometer is made a link in the draught-chain, and then subjected to the tension which it is desired to ascertain. In such cases the instrument used is simply a spring; and by the amount of extension or collapse which it suffers the intensity of the strain which it has experienced is indicated. One of the most common dynamometers of this kind is formed of an elliptical spring, which, in proportion to the longitudinal extension suffered when in use, experiences a lateral collapse, the measure of which indicates the amount of strain to which it has been subjected. In Clyburn's dynamometer the strain is indicated by the compression of a spiral spring inclosed in a cylindrical case, the extent of the strain being shown by an index moving along a scale on the outside of the implement.

DYRRHACHIUM. See DURAZZO.

DYSART, a royal and parliamentary burgh in the county of Fife, situated on the Frith of Forth, 13 miles north-east of Edinburgh. It manufactures a few ticks, checks, and other linen goods, and ships some coal. Its harbour is excellent. Dysart House, the seat of the Earl of Rosslyn, is in the immediate vicinity. It has a good harbour, formerly defended by a battery, called the Fort, constructed by Oliver Cromwell, on the summit of a high rock. Though now a dull place, it possessed great importance in the fifteenth century, and was famous both for its collieries and salt works. A little to the west of the town, on a steep crag pointing to the sea, stand the ruins of the ancient castle of Ravenscraig, alluded to under the name of Ravensheuch, in Scott's Lay of the Last Minstrel. Dysart is one of the Kirkcaldy district of burghs. Pop. of royal burgh in 1871, 1812; of parliamentary burgh, 8919.

DYSENTERY (from the Greek *dys* or *dus*, difficulty, and *entera*, the bowels), the flux. It is known by contagious fever; frequent griping stools; tenesmus; stools, chiefly mucous, sometimes mixed with blood, the natural fæces being retained, or voided in small, compact, hard substances, known by the name of *scybala;* by loss of appetite, and nausea. It occurs chiefly in summer and autumn, and is often occasioned by much moisture succeeding quickly intense heat or great drought; whereby the perspiration is suddenly checked, and a determination made to the intestines. It is likewise occasioned by the use of unwholesome and putrid food, and by noxious exhalations and vapours; hence it appears often in armies encamped in the neighbourhood of low, marshy grounds, and proves highly destructive; but the cause which most usually gives rise to it is a specific contagion; and when it once makes its appearance, where numbers of people are collected together, it not unfrequently spreads with great rapidity. A peculiar disposition in the atmosphere seems often to predispose or give rise to the dysentery, in which case it prevails epidemically. It frequently occurs about the same time with autumnal intermittent and remittent fevers; and with these it is often complicated. The disease, however, is much more prevalent in warm climates than in cold ones; and in the months of August, September, and October, which is the rainy season of the year in the West Indies, it is very apt to break out, and to become very general among the negroes on the different plantations in the colonies. The body having been rendered irritable by the great heat of the summer, and being exposed suddenly to much moisture with open pores, the blood is thereby thrown from the exterior vessels upon the interior, so as to give rise to dysenteries.

An attack of dysentery is sometimes preceded by a loss of appetite, costiveness, flatulency, sickness at the stomach, and a slight vomiting; and comes on with chills, succeeded by heat in the skin, and frequency of the pulse. These symptoms are in general the forerunners of the griping and increased evacuations which afterwards occur. More or less fever usually attends, with the symptoms which have been described, throughout the whole of the disease, where it is inclined to terminate fatally; and is either of an inflammatory or putrid tendency. In other cases the febrile state wholly disappears after a time, while the proper dysenteric symptoms probably will be of long continuance. Hence the distinction into *acute* and *chronic* dysentery. When the symptoms run high, produce great loss of strength, and are accompanied with a putrid tendency and a fetid and involuntary discharge, the disease often terminates fatally in the course of a few days; but when they are more moderate, it is often protracted to a considerable length of time, and so goes off at last by a gentle perspiration, diffused equally over the whole body; the fever, thirst and griping then ceasing, and the stools becoming of a natural colour and consistence. When the disease is of long standing, and has become habitual, it seldom admits of an easy cure; and when it attacks a person labouring under an advanced stage of scurvy, or pulmonary consumption, or whose constitution has been much impaired by any other disorder, it is sure to prove fatal. It sometimes appears at the same time with autumnal intermittent and remittent fevers, as has been observed, and is then more complicated and difficult to remove. Upon opening the bodies of those who die of dysentery, the internal coat of the intestines (but more particularly of the colon and rectum) appears to be affected with inflammation, and its consequences, such as ulceration, gangrene, and contractions. The peritonæum, and other coverings of the abdomen, seem likewise, in many instances, to be affected by inflammation.

DYSODILE. At Melilli, near Syracuse, in Sicily, and in different parts of France, a yellowish or greenish foliated mineral, with remains of fish and of plants, is found imbedded in limestone, which when ignited burns and emits a very bad smell. Otherwise it has

an odour of clay. It is very brittle, but when steeped in water the plates acquire flexibility. It seems to be a porous clay, which has absorbed the products of decomposition of animal matter, and hence its odour. It seems therefore to resemble some of the rocks at Strathpeffer and elsewhere, which have an offensive odour when rubbed or heated, and are consequently called *swine-stone* or *stink-stone*.

DYSPEPSIA (*dyspepsia*, from Greek *dys* or *dus*, difficult, and *pepsis*, digestion), difficulty of digestion. The strict etymology of the term implies an imperfect or disordered condition of the function of digestion. The disorder of the digestive function is the most frequent and prevailing of the ailments that afflict man in the civilized state; all classes and all ages suffer from its attacks. Few are so happy as to pass through a life of ordinary duration without undergoing a protracted struggle with this malady, and experiencing its torments. Once let it be fully established, and the comfort of existence disappears, or is regained, in most cases, tediously, and at the price of the most ascetic self-denial. The greater prevalence of dyspepsia or indigestion, in modern times, arises from the more frequent injury done to the stomach and its functions, directly, by the habits of luxurious indulgence, which have been exceedingly increased and extended; and indirectly, by the multiplication of intellectual and moral agitations, from the extension of the commercial and financial operations of society, the greater activity and employment of the intellectual faculties, and augmentation of political, social, and individual reverses. A large proportion of the discomfort produced by this malady arises from an ignorance of the digestive functions, leading to their abuse and premature derangement, and may be obviated, to a great extent, by instruction as to the nature of these functions, and their natural exercise. A general view of the digestive organs and functions is, therefore, requisite to an understanding of their disorders, the means to prevent, and the methods to remedy them.

All organized or animated beings hold their existence under the condition of renewing incessantly the elements of their composition, by the appropriation to themselves of exterior matters. The simple animals (Polypi, &c.) find, in the medium in which they live, and from which they directly receive them, the principles serving for their composition. The decomposition of animal and vegetable matter in the soil prepares the aliment or nutritive principle of vegetables, which, being held in solution by water, is absorbed by their roots. In all these beings there are no digestive organs or functions. The preparation of their nutriment is effected by physical operations exterior to themselves, and over which they have no control. In the higher or complete animals, or in man, the case is very different. Nature does not present to them the nutritive elements in a state fitted to be introduced at once into the interior organism, and to be employed in its composition. Their aliment consists of the nutritive principles in a compound state, intimately combined with other substances, from which they require to be disengaged. This is accomplished by the animal itself, which is provided with especial organs or apparatus and functions for this purpose. Digestion, then, consists in the disengagement of the nutritive elements from their combinations, and their reduction to the molecular state, admitting their introduction into the vessels, and their diffusion throughout the organism, for the purposes of its composition. It is a process analogous to the decomposition of the aliment of vegetables in the soil, and is effected, like all decompositions, by analogous or chemical operations. In this class, the procuring of the aliment is the act of the animal, depending on its voluntary powers, and is controlled by a great variety of circumstances, affecting the quantity and quality of the food.

The organs composing the digestive apparatus in man are numerous. They are the mouth, armed with teeth, for mechanically breaking down the food by mastication; the salivary glands, furnishing a fluid intimately combined with the food in mastication, and collected in the stomach, which is its reservoir; the pharynx, a muscular and membranous bag, for the reception of the masticated bolus from the mouth; the œsophagus, a muscular and membranous tube, for conducting the bolus into the stomach; the stomach, a muscular and membranous bag, or enlargement of the alimentary canal, secreting a fluid, or fluids, and a reservoir of the salivary and other secretory fluids of the interior surfaces, and in which the food is subjected to the decomposing process, until reduced to a pulpy mass called *chyme*, consisting of the nutritive and innutritive elements, in a state of mechanical mixture; the duodenum, or second stomach, in which the chymous mass is submitted to the action of the biliary and pancreatic fluids, and in which the nutritive elements begin to separate from the innutritive matters, and to be absorbed by the lacteals, the roots of the animal economy; the liver and pancreas furnishing bile and a species of saliva, which are mixed with, and act on the chyme in the duodenum, the jejunum and ileum, or small intestines, in the course of which the separation begun in the duodenum is completed, and nearly the whole of the nutritive principles forming chyle are absorbed; and lastly, the large intestine, a reservoir for all the excrementitious principles, and which, in it, are converted into fæces. The whole of these organs compose the apparatus of digestion, but all are not of equal importance. The stomach and duodenum are the most important organs, and those whose condition exercises the greatest influence over the powers of digestion. This apparatus is intimately connected, and a natural state of each of its parts, and a due exercise of the function of each, are essential to the healthy undisturbed performance of digestion. This connection is maintained through the ganglionary system of nerves, which not only unites these organs together, but combines them with all their congeries, appropriated to the perfect elaboration of the nutritive and sustaining principles of the economy. The stomach is the centre of the digestive apparatus, and may be regarded in nearly the same view for the whole of the organs connected with individual nutrition. It owes this character to its intimate union with the great solar plexus, the centre or brain, if it may be so termed, of the ganglionary system, regulating the nutritive functions. It is also immediately associated with the brain, through the medium of the eighth pair of pneumogastric nerves, and thus is placed in relation with the exercise of the moral and intellectual faculties. The stomach is consequently exposed to be disordered in its functions by violent impressions from these faculties, as they are also liable to be affected by the disordered conditions of the stomach. It is necessary to have these diversified connections pointed out, to possess a clear understanding of the numerous and very different sources from which disturbances reach the process of digestion.

A few words will now be necessary as to digestion itself. It is not all substances that are fitted for aliment and are susceptible of digestion. Food is intended for the renovation of the body. It must consist of the same elements as the animal structure, and be capable of becoming organized and living. It must then contain at least three elementary animal principles—hydrogen, carbon, and oxygen;

and much of it contains also a fourth—nitrogen. These elements form secondary compounds, in which state alone they constitute aliment; such are albumen, fibrin, gelatin, oil, farina, mucilage, and other animal and vegetable compounds. In all these substances the molecules are easily separable without being chemically decomposed, which is one of the primary requisites of digestibility, and to effect which is the chief object of digestion. The masticated and insalivated food passes into the stomach. Here it is macerated in the saliva collected in the stomach, and in the proper liquid secreted by the villi of the gastric mucous membrane, at a temperature of 104° Fahr. This liquor is called *gastric juice*. Its true nature is not accurately determined, but as far as examination has ascertained, it resembles saliva mixed with a small portion of lactic or muriatic acid. The stomach, in a healthy state, always contracts on its contents, so that its walls in digestion are always in contact with the food. During digestion the stomach has a constant vermicular motion; its muscular fibres contracting successively from the smaller to the larger end. The food is thus agitated, acquires a rotatory movement, and is mingled with the fluids of the stomach. In a short time the change accomplished in the stomach begins, the food becomes pulpy, and then reduced to a semi-fluid of a light grayish colour. From the uniform pressure of the stomach, the solid and most resisting portions are forced into the centre, while the digested and more fluid matter is found on the surface, and is gradually carried, by the contraction of the muscular fibres, into the duodenum.

Mr. Philips and others have been led to suppose from this circumstance that the food in contact with the walls of the stomach was alone digested; but it is a mere physical result, as uniform pressure in every direction, on a mass of different consistency, will alway drive the most fluid to the circumference. The pulpy grayish substance resulting from the stomachic digestion is called *chyme*. When examined with the microscope, the writer of this article has always found it to consist of an immense number of transparent globules, of various sizes, intermixed with undissolved fragments of the fibres of the alimentary substance. When food is masticated and macerated for a few hours in simple saliva, he has found it to present exactly the same appearances as the chyme of the stomach. *The digestion of the stomach, he infers from his experiments, is not a decomposition of the alimentary matter, but is a simple disintegration or reduction of it into its component molecules, the animal character remaining unchanged.* The chyme, having passed into the duodenum, meets with the pancreatic liquor and the bile. What are the positive changes induced by these fluids, certainly is not accurately known. The acids of the chymous mass are neutralized by the alkaline principles of the bile, the picromel and colouring matter of which appear to coalesce with the unassimilable principles of the food, and assist in their conversion into fæces. A chemical modification in some of the alimentary elements may also be effected. It is certain that chyle, or the nutritive principles of which blood is formed, does not appear in the lacteals until after the action of the bile and pancreatic fluid on the chyme, the product of the stomachic digestion. The action of the stomach on the food is that usually designated as *digestion*, and it is the derangement of this process that is usually expressed by the term *dyspepsia*. The process accomplished in the duodenum is also a true digestion, and the symptoms arising from its disordered state are confounded with those of the stomachic digestion in the general accounts of dyspepsia.

From this sketch of the function of digestion it is evident that its most important agents are: 1st, The secreted fluids collected in the stomach; 2d, The contractile movements of the stomach, keeping the alimentary mass in constant agitation, mixing it with the fluids as they are secreted, and removing the portion digested or reduced into chyme; 3d, The application of the biliary and pancreatic fluids to the chyme in the duodenum; and, 4th, the contractile movements of this viscus. Most of the derangements of the digestive functions may be traced immediately to a departure from a natural state of some one or more of the above requisites of digestion. But this deviation from the natural order is itself an effect. The secretions are products of organs, and all excitement of the secretory organ, beyond the range of healthy action, causes vitiation of the secretion, or its total suspension. The action of the organ, diminished below the physiological range, is attended with other vitiations of the fluid, or the cessation of its secretion. Indigestion or dyspepsia is a consequence of both these conditions of the organs furnishing the fluids of digestion. Digestion is a very stimulating process. All functional actions are exciting. The increased demand for secreted fluids renders an augmented action and increase of blood in the furnishing organ necessary for their production. The presence of the food, drinks, &c., in the stomach, add to the stimulation of digestion. If the stomach of an animal be examined in the act of digestion, the mucous membrane is found of a diffused scarlet colour. The movements of the stomach essential to digestion depend on its nervous communications, and especially on the integrity of the eighth pair of nerves. When these are divided the stomach and œsophagus are paralyzed; the food is no longer agitated and mixed up with the digestive fluids, and it often regurgitates from the stomach into the œsophagus. This experiment proves the influence of the contractile motion of the stomach in the act of digestion. The ganglionic nerves are not less important, though their specific influence cannot as readily be determined. But in many cases of disease of these ganglions vomiting, eructations, pain in the gastric region, and impaired digestion are accompanying symptoms. Through the nervous system the function of digestion is exposed to numerous disorders from moral impressions, especially those of an agitating character.

From the preceding principles it is evident that dyspepsia or indigestion is not properly speaking, a disease, but rather a symptom attached to diseases of the apparatus of digestion, of very various and even opposite character. No specific treatment can, therefore, be laid down for the cure of dyspepsia, but each case requires to be managed according to its peculiar cause and nature. The organ of the digestive apparatus the most frequently productive of dyspeptic symptoms is the stomach, and the most usual cause of dyspepsia is its irritation and inflammation. The stomach is more liable than any other organ to these states, from its direct exposure to so many irritating aggressions, and its intimate sympathetic communications, which make it participate in the irritations of almost every other organ. The sub-acute and chronic forms of gastric irritation and inflammation, the signs of which have only of late been fully appreciated, are the disorders that, in seven or eight cases out of ten, are termed dyspepsia. Hence dyspepsia so frequently succeeds to febrile diseases, especially when treated by emetics, drastics, and the improper use of tonics and stimulants, which, although the patient escapes the fever, leave him a martyr to the chronic, disorganizing, and perturbating irritations of the gastric mucous membrane. Hence, too, dyspepsia almost inevitably follows continued abuse of the digestive functions, from too highly seasoned or too

abundant food, and stimulant drinks. The constant stimulation of the stomach finally becomes pathological or morbid. The simple prolongation of the functional excitement essential to digestion, continued from meal to meal, without permitting the stomach to revert to a state of repose, is sufficient to constitute a morbid state. All functions, for their perfect performance, require alternate periods of repose and activity. Incessant action irritates, inflames, and finally disorganizes the structure of the organs.

A second condition of the stomach, productive of dyspepsia, is the congestion of its mucous tissue. This may be confined to the stomach alone, succeeding to an attack of acute gastritis, or following on its protracted irritation; or it may be an attendant on a general congestion of the whole portal system involving most of the abdominal viscera. Every irritation is attended with an afflux of the circulating fluids into the structure where it is seated, proportioned to its intensity and the vascularity of the structure. This gorged state often continues after the subsidence of the irritation that provoked it, and prevents the resumption of the healthy functions. It is a state of passive congestion, and often exists in the mucous membrane of the stomach after attacks of inflammation or acute irritation, and embarrasses its digestive operations. In all the extensive irritations of the alimentary canal, especially when attended with fever having a paroxysmal character, the great portal system of the abdomen becomes loaded with blood, and congestion of its radical vessels ensues. The functions of the viscera are then disordered, the secretions are defective, and indigestion, costiveness, and their attendant nervous affections are the necessary consequences of this condition.

A third state of the stomach, a cause of dyspeptic symptoms, is precisely the reverse of the preceding. Asthenia, or diminution of vitality and actions below the healthy degree, occasionally takes possession of the stomach. Its circulation is then deficient, its secreted fluids are defective in quantity or quality, its sensibility is impaired, and digestion is imperfect. It is not probable that gastric asthenia is ever primitive, It succeeds to previous irritation, and is often occasioned by irritation in other organs.

The preceding form a first class of dyspeptic diseases, which, depending entirely on the stomach, may be termed *gastric dyspepsia*. They present characters totally different, and require a very opposite treatment. This class embraces three species.

A second class of dyspeptic diseases is connected with the duodenum and its functions. This viscus, similarly constituted to the stomach, is subject to the same morbid alterations. Its mucous membrane is the seat of irritation in its various grades, and productive of its usual consequences—augmented irritability, sensibility, perversion of secretions, vitiation of structure, and disorder of function. Duodenic irritation most commonly accompanies gastric irritation, and the symptoms of the two are blended together. It exists, however, in many instances, independently, and then manifests particular symptoms, which are often termed dyspepsia. It is, more especially, the chronic irritation of the duodenum that passes for dyspepsia. It is not probable that congestion or asthenia ever affect the duodenum exclusively to the detriment of its function. When these states prevail, it is in conjunction with similar conditions of the whole digestive apparatus. At least we have no knowledge of these states limited to the duodenum.

A third class of dyspeptic diseases depends on the nervous organs which furnish nerves to the digestive viscera. The ganglionic system of nerves, distributed on each side of the spine, from the head to the pelvis, transmits nerves to all the organs connected with the nutritive function. The stomach especially is largely supplied from the solar plexus, and it receives likewise numerous nervous filaments from the pneumogastric, placing it in connection with the functions of relation. The offices of the ganglionic system are not ascertained with precision. It is, however, well determined that diseases of the ganglions disorder the functions of the viscera to which they transmit nerves. Hence arises an order of dyspeptic symptoms independent of any immediate affection of the stomach, but occasioned by disease in the great solar, or other neighbouring plexus. The disorders of the digestive functions, from this cause, are various. The sensibility of the stomach is sometimes greatly increased, constituting gastralgia. At other times the secreted fluids of the stomach are morbidly acid. The stomach appears, in other cases, to be partially paralyzed, and the peristaltic movements necessary for the admixture of the food and the gastric fluids, and the continuous passage of the chyme into the duodenum, are suspended. At the same time considerable quantities of wind collect in and distend the stomach, preventing its action on the food. Mechanical manipulation of the abdomen, and particularly of the epigastrium, after a meal, becomes a substitute for the natural motion of the stomach, expels the wind, and facilitates digestion, that would otherwise be laborious and painful.

Dyspepsia or indigestion, from this analysis of its modes of production, is seen not to be a disease of uniform character, and depending on an identical state of the digestive organs. It is attached as a symptom, rather, to a variety of conditions, each of which requires to be managed in its appropriate mode. It is not possible that it can be remedied by any one general mode of treatment, or by any set of specific remedies. The most common causes of dyspepsia are excesses of various kinds, especially in the quantity of food eaten. Most individuals in this country err in this respect. Meat at three meals daily can be borne only by the most robust frames, and by hard labourers. Persons of a sedentary life require less nutriment; the economy makes less demand on the stomach for supplies; and if it be compelled then to labour, it is at its own loss. Exercise, or the expenditure of the nutritive elements by the economy, and the quantity of food to be digested must be proportioned to each other, for the preservation of health and the due vigour of digestion. This fundamental principle is laid down in an axiom by Hippocrates—'Homo edens sanus esse non potest, nisi etiam laborat:' A man that eats cannot be healthy unless he also works. Good cookery, by rendering food more digestible, is one preservative against dyspepsia. The food, by being rendered tender and pulpy, is reduced to chyme in a shorter period, with a smaller expenditure of the secreted fluids, and less excitement of the stomach, than when it is not properly concocted. The powers of the stomach differ in individuals as much as the force of their muscles; and each one must adopt a mode of nutrition, both as to quantity and quality of food, suitable to the wants of his economy and the digestive capacity of his stomach. The quality of food is a frequent cause of dyspepsia. Tough and badly dressed meats, and crude vegetables, are among the prominent causes of this affliction, as are also hot bread and cakes, heavy and fresh bread, and the daily use of hot tea or coffee for breakfast. In enumerating the more common causes of dyspeptic symptoms, we ought not to omit the frequent exacerbations of the malevolent passions, as anger, hatred, envy, jealousy, and, what is not often suspected, excessive indulgence and abuses of the venereal propensity. An-

other fruitful source of the digestive disorders is found in the employment of emetics, and in a frequent resort to saline or drastic cathartic medicines. When a constipated habit prevails, it should always be overcome, if possible, by a laxative regimen, and the aid of purgatives be cautiously and rarely invoked.

DYTISCUS, more correctly DYTICUS. See WATER BEETLE.

DZIGGETAI, or KIANG (*Equus Hemionus*), an animal found in Central Asia, allied both to the horse and the ass. Its distinguishing marks are, no long hairs on the tail except at the extremity, a longitudinal dorsal streak, broadest over the small of the back, and no cross-band on the shoulders. In other respects it resembles the horse in front, and the ass behind. Like the ass it has a large head, but the form of the head is like that of the horse. The ears are not so long as those of the ass, and in shape resemble horses' ears. It is a delicately formed animal, and very light in its movements; it runs with a rapidity exceeding that of the best Arabian horses. It has been acclimatized in Europe, and has brought forth young in several zoological collections. It has even been broken in and trained to the saddle.

DZOUNGARIA, ILI PROPER, or THIAN-SHAN-PE-LOO, an extensive territory in Central Asia, the boundaries of which are not very well defined. It stretches from about 41° 30′ to 48° 41′ N. lat., and from about 78° to 96° E. lon. The surface consists chiefly of an elevated and almost desert plateau, surrounded and partly intersected by lofty mountain-chains. Numerous rivers descend from the mountains, but many of them, before attaining much magnitude, disappear in the sands of the desert, or empty themselves into its lakes. Large tracts are altogether or nearly unfit for human habitation, but some of the plains, and many of the valleys, are covered with good pasture. The chief grains produced in the arable portions are millet and barley. Dzoungaria was originally the independent empire of the Dzoungars, a branch of the Mongols, but about 1754 the territory was subjugated by the Chinese, under whom it remained till the rebellion which broke out in 1861 or 1862, and which resulted in the loosening of the hold which the Chinese had over it.

E.

E, the second vowel and fifth letter of the Latin alphabet, and of other alphabets, such as the English, German, French, Italian, Spanish, &c., derived from it. In Latin it had sometimes a long and sometimes a short sound, but in Greek two characters were employed to represent these different sounds, namely, E or ε for short *e*, and H or η for long *e*. *E* was the weakest of the Latin vowels, and accordingly it frequently took the place of the other vowels when their sounds became weakened. Many Latin words which in their simple form contain *ă* change this to *ĕ* when they are compounded, as from *fallo, refello;* from *mando, commendo;* from *castus, incestus;* from *aptus, ineptus;* and this is particularly the case before two consonants. *E* was always used also in the reduplication of verbs having *a* in their first syllable, as *cado, cecidi; pario, peperi; tango, tetigi,* &c. *E* was sometimes substituted for *o* and *u*, but this was not very common; examples are *vertex, vester, verto,* for *vortex, voster, vorto; dejero* and *pejero,* from *juro*. *E* appears instead of *i* in the neuters of adjectives in *is*, as *facile, gracile, acre,* &c., and sometimes in datives of the third declension, as *morte* for *morti*. It is also frequently found in manuscripts instead of the diphthongs *æ* and *œ*. In the Romance languages we find *e* sometimes taking the place of *i* in Latin, and *i* sometimes taking the place of the Latin *e*; as Lat. *mittere*, It. *mettere*, Fr. *mettre; missaticum*, It. *messaggio*, Fr. *message; limbus*, It. *lembo; lignum*, It. *legno*, &c.; *cera*, Fr. *cire; medius locus*, Fr. *milieu; meliorare*, It. *migliorare*. We also find the Latin *e* represented by *ie* in French and Italian, as *mel*, It. *miele*, Fr. *miel; pes*, It. *piede*, Fr. *pied: brevis*, It. *brieve*, Fr. *brief*, &c. The letter E in English has at least five sounds, as in the following five words: *mete, met, there, obey, her*. It is frequently used at the end of a monosyllabic word to indicate the preceding vowel is to be pronounced long; compare *pin, mad, met, can, not, tub*, with *pine, made, mete, cane, note*, and *tube*. The number of *e* sounds in French is variously given by different authorities, some admitting only three, others as many as nine. The French Academy recognizes only three sounds of *e* in French, the *è ouvert* or open, the *é fermé* or shut, and the *e muet*, all of which occur in the words *sévère, évêque, échelle*. To these however there ought at least to be added the *e* of such words as *je, te, se, me*, &c. In German there are four different ways of pronouncing the letter *e;* 1, merely as an aspiration, or very short indeed, as in *hatte* or *hoffen;* 2, short, like the English *e* in *bet, met*, as in *recht, rennen;* 3, long, like the English *a* in *fate*, as in *reden, predigen;* 3, like the French *è ouvert*, or like the German *ä*, as in *Elend*, although little distinction is generally made between the two latter. Some provinces generally pronounce both like the latter; others pronounce them like the former, or like *a* in *fate*. The letter *e* may be called an intruder into the German language, because it has taken the place formerly occupied by full and melodious vowels, and it occurs too often. E is the commonest letter in English. E, in the Greek numeration, signified five. E, as an abbreviation, stands, in English, for *east*. On ancient medals it stands for the names of cities which begin with this letter; for *exercitus, effigies, edictum*. E, in music, is the third note of the diatonic scale of C, answering to the *mi* of the Italians and French. See ABBREVIATIONS.

EADMER, an English monk, the friend and biographer of St. Anselm. He became the friend of Anselm about 1093, and after that date little is known about him till 1120, when he was chosen Bishop of St. Andrews. This dignity, however, Eadmer did not accept, because the Scottish king refused to allow him to be consecrated by the Archbishop of Canterbury, the supremacy of which in Scotland he did not acknowledge. Eadmer accordingly returned to England, and died a simple monk of Canterbury. The time at which his death took place is not known with certainty, but it is supposed to have been in January, 1124. Besides the life of St. Anselm, Eadmer has also written the lives of St. Wilfrid, St. Dunstan, St. Odo, and other English saints, as well as a treatise on the Excellence of the Holy Virgin, and another on the Four Virtues possessed by Mary.

His most important work is the History of his own Time (Historia Novorum), a narrative of events in England and the English Church, from 1066 to 1122. The best edition of this work is that of Selden (London, 1623).

EAGLE, a gold coin in the United States of the value of ten dollars, or £2, 1*s.* 8*d.* sterling. It was first coined in 1795, in accordance with an act of Congress, dated January 2, 1792. There are also half eagles (first coined in 1795), quarter eagles (first coined in 1796), and double eagles (first coined in 1849), of proportionate values.

EAGLE. The eagles form a group or sub-family (Aquilinæ) of the great family Falconidæ which includes the eagles, falcons, and hawks, and forms one of the three great divisions of the order Raptores or Accipitres. The eagle has been elevated, by the popular voice, to the rank of the noblest and most courageous of the rapacious birds. Its natural fierceness is so great that it has seldom been employed for the purposes of the chase; but the Kirghis and other tribes of Central Asia use the golden eagle to kill antelopes, foxes, and even wolves. The eagle soars to a greater height than any other European bird, from which circumstance the ancients considered it as a messenger of Jove, '*Fulvam aquilam Jovis nuntiam.*' Its sense of sight is exquisite. It lives for a great length of time, even in the captive state. Mr. Pennant mentions one in the possession of a gentleman, which he had kept for nine years, and the person from whom he had received it thirty-two. The leading genera of this sub-family and their most familiar species are as follows:—

1. *Aquila.* Bill long, powerful: curve commences at cere, margins sinuous: wings reaching to tip of tail, which is broad and moderately long: tarsi feathered to the toes.

A. imperialis, Bechst. This, the Imperial Eagle, is the largest known species. It lives on the forest-covered mountains of Germany, Hungary, and Dalmatia, and is probably the species to which the popular belief in the courage, strength, and nobleness of eagles is to be traced. It has a large white spot on the scapulars; the tail is black, marked above with gray: the female is fawn-coloured, with brown spots. It is known as *A. bifasciata*, Gray; *A. heliaca*, Sav.; *A. Nepalensis*, Hodgs., as far south as the Deccan. *A. chrysaëtus*, the Golden Eagle, though smaller than the preceding, measures over 6 feet from tip to tip of the expanded wings, and 3 feet from the beak to the end of the tail. The adult plumage is perfected in the third year, prior to which the young birds have been spoken of as a separate species, the ring-tailed eagle, *A. fulva*. The adults have the body brownish, becoming darker with age: the feathers of the head and neck pointed, and of a golden-red hue: tail deep gray, barred with brown, and ending with that colour: beak bluish-black: cere and feet yellow: iris brown: wings do not reach to end of tail: female larger than male. The young birds have the inside of the thighs and tarsi white, not brown: lower tail-coverts whitish: greater part of tail white above, but ending in a brown patch. This species is found all over the northern hemisphere, but is less frequent in America, and does not range south of the Himalayas, where, however, it is sometimes confused with the lämmergeyer. The nests are of great size, and, situated in inaccessible places, are used year after year; their great size is necessary not merely to support the birds, which weigh about 18 lbs., but also the large quantity of prey which they collect. The eggs are two in number, white, with brownish and purplish blotches. Other species are the Spotted Eagle (*A. nœvia*, Gmel.), which is common in India, and even visits Europe; it feeds on small animals: the Tawny Eagle (*A. fulvescens*, Gray) of Central India: *A. nœvioides*, a robust African eagle: *A. morphnoides*, Gould, from Australia: the Black Eagle (*A. Malaiensis*) of southern India and the Malay Peninsula.

2. The Hawk Eagles include the genera *Spizaëtus*, Vieill.; *Limnaëtus*, Vig.; *Morphnus*, Cuv. *Spizaëtus* has the bill strongly curved; the wings reach to the middle of the tail, which is long and broad: the 4th, 5th, and 6th wing feathers are nearly equal, the 5th the longest. This genus is represented in Africa by *Sp. ornatus*, Vieill.; in South America by *Sp. tyrannus*, Gray, from Brazil. *Morphnus*, also a South American genus, is perhaps closer to the buzzards. *Limnaëtus* has a short high bill, with a strong festoon on the upper mandible: the wing is short, the tail long and square: the head is usually crested. These birds have a more hawk-like aspect than the preceding. The Variable Hawk Eagle (*L. nivæus*, Temm.) is found in Bengal; the Spotted Hawk Eagle in the Himalayas, Khasia Hills, and Ceylon. Several other species occur, whose distinctness is not, however, certain.

3. The Serpent Eagles, *Circaëtus*, are found in all parts of the world. *C. gallicus*, the common Serpent Eagle, ranges from Germany and Switzerland through southern Europe, Asia, and Africa, as far as the Deccan, its metropolis being in Africa. The bill is shorter and more evenly rounded from the base, and entire on the margin. The wings, which reach nearly to the tip of the broad, even-ended tail, have the third and fourth feathers the longest. The tarsi are naked, and the toes rather short, the lateral ones equal. The adults are darker brown above and on the head than are the young; the under parts are fulvous in youth, with longitudinal brown streaks from chin to breast, the rest white, with a pale brown streak on the centre of each feather. In maturity they are white from chin to vent, and the brown marks are broad stripes which form a zone on the breast. The female is larger than the male, and measures 30 inches. The food is chiefly reptilian, but it will even condescend to centipedes and large insects. In structure and habits this bird is nearer to the buzzards than any other of the eagles. The Crested Serpent Eagle (*Spilornis*) is confined to south and east Asia.

4. The Fishing Eagles, or Sea Eagles, differ as a group from the other eagles in the less breadth of the sternum posteriorly, and in the presence of a small notch; the intestines are also longer. The Osprey, or Bald Buzzard (*Pandion haliaëtus*, Linn.), is represented by specimens from all parts of the world. Mr. Gurney considers that only one species exists in Europe, America, Africa, Asia, and Australia. The female is about 26 inches in length, the male somewhat shorter. It is white on the head, the nape, and under surface, dark-brown on the upper surface; stripes of the latter colour mark the forehead and the tail, and pass from the eyes over the ears; while the breast is marked with brown spots in youth which coalesce into bars in the adult. The claws are rounded beneath, and the sides are prickly with rigid scales. It is a keen fisher, darting down on its prey with violence, and bearing it to the land to be devoured when permitted by the Bald Eagle. The latter (*Haliaëtus leucocephalus*), found in North America and north-east Asia, is the symbol of the United States, though Franklin deplores the selection on account of his mean and dishonest habits. Like all members of the genus his diet is less restricted than that of the true eagles; he even takes carrion, and is especially fond of preying on the industrious fisher, the osprey. The gradations of plumage up to that of maturity have been carefully studied, and are instructive as showing the danger of specific identifications on single specimens. Genera and sub-genera have been founded on specimens from various parts of the world, and t[illegible]

wide distribution of the group is in relation to its antiquity, the Eocene clays of Paris having yielded fossil representatives.

5. The Hawk Eagles are true eagles in respect of their large size, powerful limbs and changes of plumage, the peculiarities, among which the shortness of their wings is most prominent, for which they have been referred to the true hawks (*Accipitrinæ*) being insufficient. Unlike the two preceding groups the tarsus is feathered. The genera are chiefly Asiatic, and perhaps the whole group should be restored to the true eagles.

EAGLE, as an ensign. As king of birds the eagle was the bird of Jove, the carrier of the lightning, and thereby expressive of sole or supreme dominion. In this sense he is used as the emblem and symbol of nations, princes, and armies. He was the hieroglyphic sign of the cities Heliopolis, Emesa, Antioch, and Tyre. Among the attributes of royalty which the Tuscans once sent to the Romans as a token of amity was a sceptre with an eagle of ivory; and from that time the eagle remained one of the principal emblems of the republic, and was retained also by the emperors. As the standard of an army the eagle was first used by the Persians. Among the Romans they were at first of wood, then of silver, with thunderbolts of gold, and, under Cæsar and his successors, entirely of gold, without thunderbolts. For a long time they were carried, as the standards of the legions, on a long staff. The imperial eagle of Germany was originally one-headed, and it is said to have been first adopted by Charlemagne, after the pattern of the Roman eagle, on the occasion of his coronation at Rome, as the symbol of the empire founded by him. As a symbol of the German Empire it had a place on the imperial standard so early as the time of Otho II. The eagle was also adopted by the Kings of Prussia, Poland, Sicily, Spain, Sardinia, by the Emperors of Russia, and by the United States of America. Napoleon chose the eagle as the standard of the French army, but it differed from the Roman eagle of the time of the empire in having its wings folded instead of outspread, and in being only gilt, not made of real gold. The eagle of the United States of America stands with outspread wings, guarding the shield below him, on which are the stripes and stars representing the states of the Union, and the motto *E pluribus unum*. The double-headed eagle was first found among the Roman emperors of the East, who thereby expressed their claims to the Eastern and Western Empires. It is first found as a symbol of the German Empire (probably to betoken the union of the imperial and the royal dignity) on a coin struck by the Emperor Louis V. in 1325. In 1846 the double-headed eagle was chosen to be the symbol of the German Confederation, and it is now that of the German Empire. The eagle is also the badge of several orders, as of that founded by Albert II. in 1433; that of the Black Eagle founded by Frederick I. of Prussia, January 17, 1701; that of the Golden Eagle instituted by Duke Eberhard Ludwig of Würtemberg in 1702; that of the Brandenburg Red Eagle, originally the Ordre de la Sincérité, founded by the Margrave of Baireuth in 1705, afterwards reconstituted under its present name, July 13, 1734; and that of the White Eagle instituted in Poland by Ladislaus V. in 1325, and included in the Russian orders by the statute of the 26th February, 1852.

EAGLE OWL. The sub-family to which the Eagle Owl (*Bubo*) belongs has the head large and broad, with conspicuous erectile ear-tufts or horns, and the facial disk less complete than in other groups. The Eagle Owl of Europe (*B. maximus*, Sibb.) attains when mature a length of about 2 feet. The throat is white, the rest of the body yellowish brown, mottled above with black, below traversed by bold longitudinal black stripes: feet covered to the claws with brownish yellow feathers. This handsome bird is found throughout Europe in mountainous situations, and is even believed to range as far east as the borders of China. It is a solitary bird, and feeds on lizards, frogs, rats, and mice, small birds, and even the young of deer. Two whole rats were taken from the stomach of one shot in the north of Scotland. It nestles in rocks and ruins, and lays two or three round white eggs. A rare bird near Rome at present, its visits were in ancient times of very evil augury, and many quaint superstitions have gathered round it, chiefly perhaps on account of the ear-tufts, which give it an unbird-like aspect. Its American representative, the Virginian Horned Owl (*B. Virginianus*, Bp.), has a very wide range in the New World.

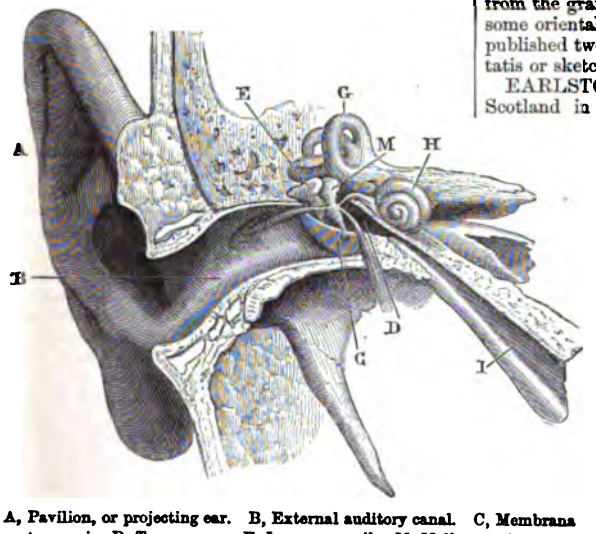
EAGLE WOOD. See ALOES WOOD.

EAGRE, a Norse word signifying the same as *bore* in a river. See BORE.

EAHEINOMAUWE, the native name of the northernmost of the two islands constituting New Zealand.

EAR (*auris*). The ear is the organ of hearing. It is situated at the side of the head, and is divided into external and internal ear. The external ear, which is the least complicated portion of the organ, is composed of the pavilion, or projecting part, called also the auricle or pinna, and the auditory canal. It is of a greater or lesser size, according to the individual. The pavilion is formed of a fibrous cartilage, elastic and pliant: the skin which covers it is thin and dry. There are also seen, upon the different projections of the cartilaginous ear, certain muscular fibres, to which the name of *muscles* has been given. The pavilion, receiving many vessels and nerves, is very sensible, and easily becomes red. It is fixed to the head by the cellular tissue, and by muscles, which are called, according to their position, *anterior*, *superior*, and *posterior*. These muscles are much developed in many animals: in man they may be considered as simple vestiges. The *meatus auditorius*, or auditory canal, extends from the concha or central hollow of the pavilion, to the membrane of the tympanum; its length, variable according to age, is from 10 to 12 lines in the adult; it is narrower in the middle than at the ends; it presents a slight curve above and in front. Its external orifice is commonly covered with hairs, like the entrance to the other cavities. The membrane of the tympanum (*membrana tympani*), of which the name indicates the function, is a membranous partition stretched obliquely across the bottom of the auditory canal, which it separates from the middle ear or drum (*tympanum*). The membrane is semi-transparent, and very thin, although it is composed of three layers; it vibrates under the impression of the sonorous waves, and transmits the vibratory movement to the little bones of the ear. Between the membrane of the tympanum and the internal ear is the drum or tympanum, a cavity hollowed out like all those of the middle and internal ear, in the petrous portion of the bone. Among the details of its form and organization we remark the *fenestra ovalis*, which communicates with the vestibule, and the *fenestra rotunda*, which leads to the cochlea. The drum also communicates with the mastoid cells, numerous cells which are found in the mastoid process of the temporal bone, containing air, and destined to multiply the vibratory surfaces; and lastly, it unites by a sort of funnel with the Eustachian tube, a canal about 1½ inch in length, which opens into the upper portion of the pharynx, and admits the air into the middle ear. The cavity of the tympanum, and all the canals

which end there, are covered with a very slender mucous membrane: this cavity, which is always full of air, contains, besides, four small bones, which have been named the hammer (*malleus*), the anvil (*incus*), the lenticular bone (*os orbiculare*), and the stirrup (*stapes*), and which form a chain from the *membrana tympani* to the *fenestra ovalis*, where the base of the *stapes* is fixed. There are some little muscles for the purpose of moving this osseous chain, of stretching and slackening the membranes to which it is attached: thus the internal muscle of the *malleus* draws it forward, bends the chain in this direction, and stretches the membranes; the anterior muscle produces the contrary effect: it is also supposed that the small muscle which is placed in the pyramid, and which is attached to the neck of the *stapes*, may give a slight tension to the chain in drawing it towards itself. The internal ear is composed of the cochlea, of the semicircular canals, and of the vestibule. The *cochlea* is a bony cavity in form of a spiral, from which it has taken its name. This cavity is divided into two others, which are distinguished into external and internal. The partition which separates them is a plate set edgeways, and which, in its whole length, is partly bony and partly membranous. The semicircular canals are three cylindrical cavities, bent in a semicircular form, two of which are disposed horizontally, and the others vertically. These canals terminate by their extremities in the vestibule. They contain bodies of a gray colour, the extremities of which are terminated by swellings. The vestibule is the central cavity, the point of union of all the others. It communicates with the tympanum, the cochlea, the semicircular canals, and the internal *meatus auditorius*, by a great number of little openings. The cavities of the internal ear are entirely hollowed out of the hardest part of the temporal bone: they are covered with an extremely thin membrane, and are full of a very thin and limpid fluid: they contain, besides, the acoustic nerve. The internal ear and middle ear are traversed by several nervous threads, the presence of which is, perhaps, useful to hearing. The following cut will show the form and position of the different parts of the ear:—



A, Pavilion, or projecting ear. B, External auditory canal. C, Membrana tympani. D, Tympanum. E, Incus, or anvil. M, Malleus, or hammer. G, Semicircular canal. H, Cochlea, or shell. I, Eustachian tube.

EARL, a degree of the British nobility between marquis and viscount. (For the origin of the title and the dignity, see ALDERMAN.) The title was made hereditary by William the Conqueror. In Latin the earls are called *comites*, corresponding to the count or *Graf* of the European continent. (See COUNT.) It is now become a mere title, the official authority which the earls formerly possessed in the counties having devolved entirely on the sheriffs (in Latin, *vice-comites*). In official instruments they are called, by the king, *trusty and well beloved cousins*—an appellation as ancient as the reign of Henry IV., who, being, either by his wife, mother, or sisters, actually related or allied to every earl in the kingdom, artfully acknowledged this connection in all his letters and other public acts. An earl's coronet is composed of eight pearls, raised upon points, with small leaves between, above the rim. There are at present 109 earls in England, 41 in Scotland, and 66 in Ireland. As the earls, for some time after the Norman conquest, were called *counts*, their wives are still called *countesses*.

EARL MARSHAL OF ENGLAND, a great officer, who had, anciently, several courts under his jurisdiction, as the court of chivalry and the court of honour. Under him is also the herald's office, or college of arms. He had some pre-eminence in the Court of Marshalsea (now abolished), where he might sit in judgment against those who offended within the verge of the sovereign's court. (Wharton's Law Lexicon.)

EARLOM, RICHARD, a mezzotinto engraver of the eighteenth century. The dates of his birth and death are unknown. His taste for design is said to have been excited by the inspection of the ornaments on the state coach of the lord-mayor, which had been painted by Cipriani. About 1765 he was employed by Alderman Boydell to make drawings from the celebrated collection of pictures at Houghton, most of which he afterwards admirably engraved in mezzotinto. In this branch of art he had been his own instructor, and he introduced into the practice of it improvements and instruments not previously used. The fruit and flower pieces executed by Earlom, after Van Huysum, established his fame. In history he distinguished himself by his engraving of Agrippina, from the grand picture by West. He also engraved some oriental scenes from paintings by Zoffani, and published two volumes of plates from the Liber Veritatis or sketch-book of Claude.

EARLSTON (originally *Ercildoun*), a village in Scotland in Berwickshire, 28 miles south-east of Edinburgh. In the vicinity are the ruins of an ancient castle, which belonged to the famous Thomas the Rhymer. The modern village is well known for its manufacture of a description of cotton goods called Earlston ginghams. At the distance of about 1½ mile is the locality rendered classical by the beautiful melody of The Broom o' the Cowdenknowes. Pop. in 1871, 1168.

EARLY ENGLISH ARCHITECTURE, the name generally given to the first pointed Gothic used in England. This style of architecture began to be used in England about the end of the twelfth century, and lasted for about a hundred years. It immediately succeeded the Norman, and finally merged in the decorated style. It is characterized by long lance-shaped windows, which are often gathered into clusters and inclosed by a large arch, the space between which and the tops of the windows is often pierced with circular, trefoil, or

quatrefoil ornaments. The mouldings consist of alternate rounds and deeply cut hollows, separated by small fillets. The doorways are often divided into two by a single shaft. The pillars usually consist of thin shafts arranged round a central pier, and the capitals are either of plain mouldings, or are enriched with deeply cut foliage. The ceilings are frequently groined.

EARNEST (in Scotland also called *arrha* or *arles*), any sum paid in advance, to bind parties to the performance of a verbal agreement. The party is then obliged to abide by his bargain, and is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated, and damages. No contract for the sale of goods not to be delivered immediately, to the value of £10 or more, is valid, unless a written contract is made by the parties, or those lawfully authorized by them, or earnest is given. In Scotland the earnest is not looked upon as part of the price, unless it bears some considerable proportion to the whole sum to be paid. In England the general view is, that the sum paid as earnest, however small, is part of the price.

EAR-RING, an ornament for the ear, consisting of a ring or hook passing through the lobe, with a pendant of diamonds, pearls, or other jewels, frequently attached. It seems to be in repute among all nations, the most savage as well as the most civilized, and it dates from the most remote antiquity. In Gen. xxiv. 22 we read that Abraham's servant presented Rebekah with an ear-ring, and the same ornament is mentioned in several other passages of Scripture. In the statue of Aphrodite by Praxiteles the goddess was represented with rings in her ears. Among the fine specimens of antique art now extant there are several heads bearing only a single ear-ring on the left ear; and it appears that the Greek children only wore them on the right ear. Ear-rings were not so commonly worn by men as by women, yet, that men did sometimes do so is evident from the fact that the Emperor Alexander Severus thought it necessary to interdict this ornament to men. The ear-rings worn by the ancients sometimes consisted of simple rings, but pendants were frequently attached to them, and these sometimes very heavy. The form of the pendants was very various. The Roman ladies used ear-rings of great value.

EARTH, the name of the planet which we inhabit. First, as to the form of the earth: To an observer whose view is not obstructed, it presents itself as a circular plain, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity, the earth was regarded as a flat, circular body, floating on the water. But the great distances which men were able to travel soon refuted this limited idea as an optical illusion; and even in antiquity the spherical form of the earth began to be suspected. On this supposition alone can all the phenomena relating to it be explained. A sphere of so great a magnitude as our earth, surrounded by a stratum of air, or the visible firmament, must present to the eye of an observer, on a plain, the appearance just described. But how could the earth appear, from every possible position, as a surface bounded by the firmament, if it were not a sphere encircled by it? How else could the horizon grow wider and wider, the higher the position we choose? How else can the fact be explained, that we see the tops of towers and of mountains, at a distance, before the bases become visible? But besides these proofs of the sphericity of the earth, there are many others, such as its circular shadow on the moon during an eclipse, the gradual appearance and disappearance of the sun, inequality of day and night, the changes in the position and course of the stars, and the gradual disappearance of some and appearance of others, as we go from the equator to the poles. Finally, if the earth were not spherical, it would be impossible to sail round it, which is frequently done. The cause of the earth's sphericity is very evident, if we consider it as having been at first a yielding mass, capable of assuming any form: then, by the force of gravity, every particle contained in it tending towards the common centre, the globular form is the necessary consequence. As to the objection to the sphericity of the earth, drawn by weak and ignorant people, from the imagination that persons and things on the opposite side of the earth from us would fall from its surface, and many similar ones, they will appear to have no force whatever, when we consider that, in a globe of the magnitude of the earth, everything on the surface tends to the centre, and that, in the true meaning of the terms *above* and *below*, all the surface of the earth is below, and all the atmosphere is above.

The earth is not, however, an exact sphere, but is flattened at the poles. This is the form assumed by a globe of fluid or pasty matter solidifying while in rapid rotation round an axis through the centre. The problem of determining the form under these circumstances was first taken up by Newton: but the complete solution of it we owe to Maclaurin, Clairaut, and Ivory. Measurements confirm their results. See also MAUPERTUIS, CONDAMINE, and DEGREE (MEASUREMENT OF).

Another important desideratum for a more intimate acquaintance with the earth was, to fix its magnitude. The labours of the ancients, in this respect, were all fruitless, owing to their want of suitable instruments. Accurate results were first obtained in the year 1615. Willibrord Snellius, a Dutchman, first struck into the only true way, and measured an arc of a meridian from Alkmaar to Leyden and Bergen-op-Zoom, by means of triangles. After him the measurements of Picard, and the later ones of Maupertuis, approximated nearer the truth. These made the circumference of a great circle of the earth 25,000 miles. But it is to be remarked that, in this calculation, the earth is regarded as a perfect sphere. Further measurements of all parts of the surface of the earth have at length fixed rigidly and accurately the true magnitude of it.

If we take a view of our earth in its relation to the solar system, astronomy teaches us that, contrary to appearances, which make the sun revolve about the earth, the earth and the other planets revolve about the sun, and, being themselves opaque bodies, receive from the sun light and heat. The earth completes its revolution round the sun in about 365 days and six hours, which forms our common year. The orbit of the earth is an eclipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; its least distance has been estimated at 93,648,000 miles, and its greatest at 96,402,000. The mean distance would therefore be 95,000,000 miles. Recent investigations of astronomers, however, have shown that this distance is too large by about 3,000,000; and that the true mean distance is about 91,678,000 miles. In winter we are nearest the sun, and in summer farthest from it; for the difference in the seasons is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The length of the path travelled over by the earth is estimated at 567,019,740 miles, and as this immense distance is passed over in a year, the earth must move 17 miles a second—a rapidity so far exceding our conceptions, that it gave very just occasion to the pleasant remark of Lichtenberg, that while one man salutes another in the street, he goes many miles bareheaded without catching cold. Be-

sides this annual motion about the sun, the earth has also a daily motion about its own axis (according to mean time, in twenty-three hours, fifty-six minutes, and four seconds). This diurnal revolution is the occasion of the alternation of day and night. But as the axis on which the earth performs its diurnal rotation forms with its path about the sun an angle of 23½°, the sun ascends, from March 21 to June 21, about 23½° above the equator towards the north pole, and descends again towards the equator from June 21 to September 23; it then sinks till December 21, about 23½° below the equator, towards the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them, which, for all countries lying beyond the equator, are equal only twice in the year, when the ecliptic coincides with the equator. Such is the Copernican system of the universe. An illustration of the revolution of the earth round the sun, and the phenomena of the seasons, is given in Pl. XLIX, L.

To the physical knowledge of the earth belongs especially the consideration of its surface and its interior. The earth's surface contains over 196,000,000 square miles, of which scarcely a third part is dry land: the remaining two-thirds are water. Of the surface of the earth, Europe comprises about one fifty-fourth part: Asia, one fourteenth; Africa, a seventeenth; and America, a sixteenth. The islands of the Pacific taken together are somewhat larger than Europe. The population of the whole earth is estimated at from 1200 to 1550 millions. The interior of the earth is entirely unknown to us, as the depth to which we have been able to penetrate is nothing in comparison with its diameter. Many modern speculators are of opinion that the interior is composed of a metallic mass. Respecting the origin and original formation of the earth there are various hypotheses. See GEOLOGY, MOUNTAINS, VOLCANOES, EARTHQUAKES, COMETS, &c.

Extra Motion of the —The earth has two motions, the daily motion round its axis, and the yearly motion in its orbit round the sun. The history of the opinion of the earth's immobility in the history of the human mind, showing, as it does, a natural ability in man to resist the impressions produced by appearances, and to receive the contrary of those which long habit, custom, and delight for many centuries. The theory of gravitation not only furnishes us the highest proof of astronomy, but makes us capable to examine other systems of that kind, after they were thus convinced that they had not reason to believe the earth to be stationary for [illegible] years. And the opinion of the ancients respecting the motion of the earth were somewhat different from the Pythagorical one, which, as we know, maintained the motion of the world round which all was moving. Thus we ought to explain the passage of Aristotle, of which instrument or expression it is applicable. Aristotle, as a Pythagorean, held the idea that the earth revolves round its axis in the same time it all circles round the sun, and that the duration of the night is to every time the earth is [illegible] with that of the sun, therefore the earth is [illegible] of the sun, therefore the motion of the earth produces in succession night and day. Later Pythagoreans have even attributed the idea with [illegible] the sun of the centre of the world, and with was at the same time a motion and a [illegible] of the earth. [illegible] was not the [illegible] of the world. It was the [illegible] of the [illegible] that [illegible] which [illegible] the [illegible] of the system in which the planets moved in cycloids round the earth. Aristarchus lived 280 B.C., Hipparchus, the great astronomer of antiquity, 150 B.C., therefore 130 years later. At this time all the writings of Aristarchus were extant, and had the Copernican system been set forth in them Hipparchus would not have despaired of explaining the motions of the planets. The same is true of Ptolemy, in whose Almagest, the most complete work of antiquity on astronomy, this system is not mentioned in the account of Aristarchus. Every Copernican speaks of the motion of the earth, but not every one who speaks of the motion of the earth is a Copernican. Copernicus was led to the discovery of his system by consideration of the complicated motion of the planets, and in the dedication of his immortal work, De Revolutionibus Orbium, to Pope Paul III., he says that the truth of his system is proved by the motion of the planets, since their successive stations and retrogradations are the simple and necessary consequence of the motion of the earth round the sun; and we need not take refuge in the complicated epicycles. Copernicus did not live to see the persecutions which the Roman Catholic priests raised against his system. They began only 100 years later (about 1610), when the telescope was invented, when the moons of Jupiter and the phases of Venus were discovered, and by these means the zeal for astronomy had been highly excited. Every city in Italy was then a little Athens, in which the arts and sciences flourished. Galileo obtained high distinction, and defended the new system of the world. The Roman inquisition summoned him before its tribunal, and he was compelled to abjure this theory. (See GALILEO.) The general sympathy for the fate of this astronomer increased the popularity of the system, and it was as violently defended on one side as it was attacked on the other. 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The cause is this: since the top of the tower is at a greater distance from the axis of the earth than its base, the motion must be greater at the former point than at the latter; the ball in falling does not lose this motion, and therefore advances before the plumb-line, which strikes the foot of the tower, since it has a less motion eastward. This hint given by Newton was followed by Hooke. He tried experiments on the motion of the earth at a height of 160 feet, and asserted that he succeeded. Only 112 years later, a young geometrician in Bologna, Guglielmini, attempted to repeat

these experiments, which had been considered very difficult by astronomers, in the tower Degli Asinelli, in that city, at a height of 240 feet. After having surmounted all difficulties, he succeeded in causing the fall of sixteen balls which perceptibly deviated eastward. But Guglielmini committed an error in not suspending the lead every day when he tried his experiments, of which he often made three or four in one night. He did not drop the plummet until after he had finished all his experiments, and as it did not come to a perpendicular position until six months, on account of stormy weather, the tower in the meantime was a little bent, the point at which the plummet should have fallen was altered, and his experiments were lost. This happened in 1792. Benzenberg, a German, performed similar experiments in 1804, in Michael's Tower, in Hamburg. He let fall thirty balls from the height of 235 feet; the balls deviated from the perpendicular 4 lines eastward. But they deviated at the same time 1½ line southward, probably owing to a gentle draft of air in the tower. He repeated these experiments in 1805, in a coal-pit, at Schlebusch, in the county of Mark, at the height of 260 feet; there the balls deviated from the perpendicular five lines eastward, just as the theory of the motion of the earth requires for the latitude of 51°, but neither southward nor northward. From these experiments Laplace calculated that the chances are 8000 to 1 that the earth turns round its axis. The invention of the telescope, by means of which the rotation of Jupiter was soon observed, but still more Newton's discovery of universal gravity, and of the nature of the celestial motions, established the theory of the motion of the earth; and in modern times no man of intelligence doubts it any longer. The French general Allix, however, endeavoured to prove that the motion of the planets does not depend on the law of gravitation. The flattening of the earth at the poles, and the diminution of gravity in the vicinity of the equator, proved by experiments on the motion of the pendulum in the equatorial regions (see PENDULUM), also give as convincing proofs of the rotation of the earth, as the aberration of light (see ABERRATION) affords of the revolution of the earth round the sun. Foucault's pendulum experiment is accepted as decisive proof of the earth's rotation.

EARTH CURRENTS. Telegraph lines, and particularly long submarine lines, are constantly troubled by violent electrical disturbances of the nature of transient currents, which rush in one direction or the other through the line. The name *earth currents* is given to these movements of electricity. They are frequently so powerful and so changeable as to render the use of the telegraphic instruments for the time impossible, the earth currents passing so rapidly as to confuse the speaking signals completely. The nature of these disturbances is not thoroughly understood. They are found, however, to be very intimately connected with the perturbations of terrestrial magnetism called *magnetic storms*, and these, it is well known, are closely connected both with the appearance of the *aurora borealis*, and with the occurrence of the sun's spots. (See STORM—Magnetic.) It seems probable that earth currents and the aurora are due to secondary discharges taking place in consequence of alterations in terrestrial magnetism, and that these alterations in terrestrial magnetism are caused by violent solar disturbances.

EARTHENWARE, as distinguished from porcelain, is opaque, as distinguished from stoneware the body is dull and earthy. It consists of clay, such as that from Cornwall, mixed with *ground flints* for the white and better kinds, or of common clay, sometimes mixed with sand and lime, and frequently coloured red or brown by iron, for the coarser varieties. The glaze depends on the quality of the ware; generally it is of a readily fusible character and contains lead; but a simple salt glaze is employed for common articles. Occasionally the unglazed body is employed, as for water-bottles, cream-jugs, vases, and ornaments; these have generally a reddish-brown colour, due to iron. The older kinds of earthenware, such as Majolica, Delft ware, Faïence, and Palissy ware, are not only glazed, but are besides elaborately coloured and enamelled and ornamented with raised figures of various kinds.

EARTHQUAKE, a shaking of certain parts of the earth's surface, produced by causes not perceivable by our senses. This motion occurs in very different ways, and in various degrees of violence. Sometimes it is perpendicular, throwing portions of the ground into the air, and making others sink. Sometimes it is a horizontal, undulating motion, and sometimes it appears to be of a whirling nature. Sometimes it is quickly over; sometimes continues long, or recurs at intervals of weeks, days, or months. At one time it is confined within a small circle; at another it extends for many miles. At one time it is hardly perceptible; at another it is so violent that it not only demolishes the works of human art, but changes the appearance of the ground itself. Sometimes the surface of the ground remains unbroken; sometimes it bursts open into clefts and chasms; and then occasionally appears the phenomenon of the eruption of gases, and also of flames, with the ejection of water, mud, and stones, as in volcanic eruptions. The eruptions of proper and permanent volcanoes are preceded by, and proportionate to the agitations of the earth in their neighbourhood. These observations furnish grounds for the conclusion that earthquakes cannot proceed from external causes, but arise from certain powers operating within the circumference or crust of the earth. Moreover, all the phenomena of earthquakes bear so much affinity to those of volcanoes, that there can hardly be a doubt that both proceed from the same causes, acting differently, according to the difference of situation, or different nature of the surface on which they operate. A volcanic eruption differs from an earthquake principally in proceeding from a permanent crater, from which similar irruptions are always liable to recur, while the recurrence of earthquakes, though frequent in the same localities, are not confined exactly to the same spot. All the other phenomena of a volcano, such as the subterranean thunder-like noises, the shaking, raising, and bursting asunder of the earth, and the emission of elastic fluids, the fire and flames, the ejection, too, of mineral substances—all occur, now and then, more or less, in earthquakes as well as in volcanic eruptions, even when at a distance from active volcanoes; and the genuine volcanic eruptions are, as has been remarked, accompanied or announced by shakings of the earth. All our observations go to prove that volcanic eruptions, earthquakes, the heaving of the ground from within, and the disruption of it in the same way, are produced by internal heat, the active manifestations of which proceed from a great depth beneath the surface of the earth. The most remarkable earthquakes of modern times are those which destroyed Lima, in 1746, and Lisbon, in 1755; in the latter 20,000 persons were killed. It extended from Greenland to Africa and America. A similar fate befell Calabria in 1783, the province of Caracas, in South America, in 1812, and Aleppo, in Syria, in 1822. Numerous earthquakes, many of them attended with fearful devastations, have since taken place in different quarters of the globe—in Europe, Asia, and America, particularly in South America, where they are almost constantly occurring.

EARTHS. The term *earth* is applied in common life to denote a tasteless, inodorous, dry, uninflammable, non-volatile, insoluble substance, which is difficultly fusible, and of a moderate specific gravity. The earths are seldom found in a state of purity in nature; their general mode of occurrence is in intimate union with each other, and with various acids and metallic oxides. Under these circumstances they constitute by far the greatest part of the strata, gravel, and soil which go to make up the mountains, valleys, and plains of our globe. Their number is nine, and their names are *lime*, *baryta*, *strontia*, *magnesia*, *alumina*, *zirconia*, *glucina*, *yttria*, and *thorina*, to which may now be added the oxides of *cerium*, *lanthanum*, *didymium*, *erbium*, and *terbium*. Three of these have long been known to mankind, the remainder have been discovered in our own times. Silex, or *silica* (which see) used to be included among the earths, but it is now known to be an acid, or, rather, an anhydride, and to have functions quite different from those of the earths. Alumina is found almost pure in ruby, sapphire, and corundum (which see), while, combined with silica, it forms the purest clay, and mixed or combined with other metallic oxides and silicates it constitutes the greater part of the clays, slates, whinstones, granites, basalts, and other commonest rocks and minerals. Lime, an earth well known from its important uses, occurs combined with carbonic acid, in which state it forms limestone, marble, chalk, and the shells of snails, oysters, &c. It exists also upon a large scale in combination with sulphuric acid, when it bears the name of *gypsum*. Magnesia is rare in a state of purity, but enters largely into the composition of some of the primary rocks, especially of the limestones. (See DOLOMITE.) The remaining earths (if we except baryta, which, in combination with sulphuric acid, is often met with in metallic veins) are only known to the chemist as occurring in the composition of certain minerals, which for the most part are rare. The earths are divided into two classes, the alkaline and proper earths. The alkaline earths are baryta, strontia, lime, and magnesia, and they have a certain resemblance to the alkalies. They are soluble in water, baryta and strontia readily, lime sparingly, and magnesia very slightly. Their solutions affect vegetable colours in the same way as the alkalies. They combine with acids, forming neutral salts, some of which are readily soluble in water, while others are quite insoluble. Their compounds with sulphur are soluble, but their phosphates and carbonates are insoluble in water. The proper earths are insoluble in water, infusible at the greatest heat of our furnaces, and, by being exposed to heat, in a greater or less degree, they lose their property of easy solubility in acids. Some of them are incapable of combining with carbonic acid, and the remainder form with it insoluble compounds. They are the following: alumina; glucina, which is found only in the beryl, emerald, and a few other minerals; yttria, found in the gadolinite, in the yttrious oxide of columbium, &c.; zirconia, found less frequently than the preceding in the zircon and hyacinth; thorina, and the oxides of the other rare metals above mentioned.

The earths were regarded as simple bodies until the brilliant researches of Sir H. Davy proved them to be compounds of oxygen with metals somewhat similar to those of the alkalies potassium and sodium. Some of the heavier of the earths had often been imagined to be analogous to the metallic oxides; but every attempt to effect their decomposition or reduction had proved unsuccessful. After ascertaining the compound nature of the alkalies Davy submitted the earths to the same mode of analysis by which he had effected that fine discovery. The results obtained in his first experiments were less complete than those afforded with the alkalies, owing to the superior affinity between the principles of the earths as well as to their being less perfect electrical conductors. By submitting them to galvanic action, in mixture with potash or with metallic oxides, more successful results were obtained; and a method employed by Berzelius and Pontin of placing them in the galvanic circuit with quicksilver terminated very perfectly in affording the metals barium and calcium in combination with this metal. By the same method Sir H. Davy decomposed strontia and magnesia; and by submitting silica, alumina, zirconia, and glucina to the action of the galvanic battery, in fusion with potash or soda or in contact with iron, or by fusing them with potassium and iron, appearances were obtained sufficiently indicative of their decomposition and of the production of substances of a metallic nature. Thorina, the last discovered earth, was decomposed by heating the chloride of thorinum with potassium. The metals of the earths approach more nearly than those of the alkalies to the common metals, and the earths themselves have a stricter resemblance than the alkalies to metallic oxides. Viewing them as forming part of a natural arrangement, they furnish the link which unites the alkalies to the metals. Accordingly, all the more recent systems of chemistry treat of these bodies as forming a single group under the name of the metallic class. It has been remarked by Dr. Ure, that whatever may be the revolutions of chemical nomenclature, mankind will never cease to consider as earths those solid bodies composing the mineral strata which are incombustible, colourless, not convertible into metals by all the ordinary methods of reduction, or when reduced by scientific refinements, possessing but an evanescent metallic existence. Since his time, however, the study of the likenesses of bodies has proved more and more the impossibility of drawing sharp lines of distinction between classes of bodies separated by such vague characters as formerly sufficed, and have shown that a natural arrangement is no longer a matter of choice, but one of necessity. Thus magnesia is no longer classed with the alkaline earths, as its analogies connect it with zinc. Two of these metals, aluminium and magnesium, have now become commercial articles, and instead of having an 'evanescent existence' in that state, are characterized by a permanency greater than that of iron. For a more particular account of the properties of the earths and of their metals consult the articles relating to them respectively in this work. See ELEMENTS.

EARTHWORKS (in fortification) are works formed of earth instead of stone, and may be used either as permanent or temporary defences. Being more easily thrown up than stone defences, they were originally used for temporary fortifications, but being found to possess some advantages, they have found advocates for use in permanent works. Their chief advantages are, that they are cheaper, more easily repaired, less liable to fracture, and that they expose the defenders to less risk from broken fragments than stoneworks. On the other hand their total power of resistance is less than that of stone, and this is considered by some authorities as conclusive against them.

EARTHWORM (*Lumbricus terrestris*), a genus of worms, order Oligochæta, belonging to the abranchiate (having no branchiæ, or external respiratory organs) section of the class Annelida. They have a long, cylindrical body, divided by transverse furrows into numerous rings; the mouth is destitute of teeth, and they have no eyes, tentacles, nor cirrhi; the intestine is wrinkled, but without convolutions. They are hermaphrodite, notwithstand-

ing which they couple, and are oviparous. The common earthworm attains nearly a foot in length. It subsists on roots, woody fibres, animal matter, &c. The body has over 120 rings; the form is tapering, with a slight bulge in the anterior part. The anterior rings are much larger and fuller than the posterior. Each of the rings has on the under surface eight short, hooked bristles, directed backwards, and on the upper, the posterior rings have one, and the anterior two pores. The bristles aid their movement, which is performed by contracting and dilating the rings, while the bristles prevent a retrograde motion. The upper part of the mouth is formed of the first segment of the body, prolonged to a sort of snout; the lower is formed of the second segment. On the fourteenth or sixteenth ring there is a fleshy swelling, convex above and flat and porous below. Some of them are phosphorescent. They live chiefly in humid places, particularly in rich and well manured soils. They are very sensitive to any disturbance of the soil. Of this anglers take advantage to bring them to the surface by thrusting a spade into the ground. They are of great service to the agriculturist by loosening the soil and increasing its depth. This is partly the result of their movement, partly of their mode of nourishment. They deposit the soil they have swallowed, after digestion, in intestine-shaped heaps called *worm castings*, which bring up rich fine soil to the surface, gradually covering the upper layer, sometimes to the extent of several inches.

EAR-TRUMPETS, instruments used by persons partially deaf, to strengthen the sensation of sound. The purpose of the external ear, both in men and beasts, is to collect, by its funnel form, the waves of sound, and conduct them to the internal organs, the seat of the sense of hearing. All the artificial instruments, then, ought to resemble in form the natural ear. They are sometimes made like a trumpet of moderate size. The smaller aperture enters the ear, and the wider is directed to the quarter from which the sound proceeds. But these instruments are inconvenient, both on account of their size and the necessity of continually holding them to the ear. Ear-cornets (so called from the French, *cornet acoustique*) are applied to the outside of the ear, and kept in their place by a slender steel spring. A small instrument, in the form of a scroll, called an *auricle*, is worn inside the ear, the mouth only being visible. It may be doubted, however, whether these instruments are as efficient as the larger tubes. Flexible india-rubber tubes, kept open by a spiral wire spring, are among the most convenient forms of ear-trumpet.

EARWIG (*Forficula auricularia*), an insect belonging to the order Orthoptera, whose name is derived from its supposed habit of insinuating itself into the ears of persons who incautiously sleep among grass where it is found. It is extremely doubtful whether the animal intentionally enters the ear; and indeed there is no reason whatever that it should, except from mere accident. A piece of an apple applied to the orifice is said to entice the insect and thus relieve the sufferer; where this fails a few drops of sweet-oil destroy the life of the earwig, which must then be extracted with a proper instrument by an operator. A remarkable fact in relation to the earwig is its great abundance at particular times, and its subsequent rarity. From the observations of entomologists it has been proved that these insects migrate in considerable flocks, selecting the evening for their excursions. Much damage is sustained by gardeners from the depredations of these little animals among fruit and tender vegetables, which constitute their proper food; occasionally, however, they feed on animal substances, and even devour each other. The places in which the species of this small genus are found are chiefly damp and cool situations, under stones and the bark of trees, among chests and boxes which have been long undisturbed, and in similar haunts. The earwig is about three-quarters of an inch in length, having the wings folded under very short and truncate elytra or wing-cases, and the extremity of the abdomen armed with a horny forceps. When alarmed the insect elevates the abdomen and opens these forceps, in order to defend itself from the attack of its enemies.

EASEL, the frame on which an artist supports his canvas. It is usually made to fold up after use.

EAST (French, *est;* German, *ost*), one of the four cardinal points of the compass, being the point of the horizon where the sun is seen to rise when in the equator, or a point on the earth determined by a perpendicular to the meridian drawn towards the quarter of sunrise. For the origin of the word, see EASTER.

EAST ANGLES, KINGDOM OF THE. See ENGLAND—History.

EASTBOURNE, a watering-place of England, county Sussex, situated on the English Channel, near Beechy Head, 64 miles S.E. from London, by the London, Brighton, and South-coast Railway. The resident population of the hundred in 1871 was 10,361. It includes, besides Eastbourne, Old Town, South Bourne, Sea Houses, and Meads. The town is handsomely built, with parades, walks, and drives, in close proximity to the sea, and an elegant pier. There are good hotels, assembly-rooms, &c. A sheep and cattle fair is held on 11th October. Large numbers of South Downs are fed on the neighbouring hills.

EASTER, the festival commemorating the resurrection of Christ. The Greek *pascha*, and the Latin *pascha*, from which come the French *pâques*, the Italian *pasqua*, and the name of the same festival in several other languages, originated from the fact that Christ was typified by the paschal lamb, sacrificed in the feast of the passover: thus Paul says (1 Cor. v. 7), 'For even Christ our passover is sacrificed for us.' The first Christians were therefore considered to continue the Jewish feast; understanding by the lamb, which was sacrificed at the festival, Jesus, who suffered for mankind. (See PASSOVER.) Among the Greek and Roman Catholics Easter is the most joyful festival of the church, and is also observed with great solemnity by the English Church, the Lutherans, and some European Calvinists. The Greek and Roman Catholic Churches did not celebrate it at precisely the same time, and while some Christians were mourning in commemoration of the passion, others were rejoicing in the resurrection of the Saviour. This sentimental difference became for centuries a fruitful source of dispute, and a cause of serious divisions in the church. In the second century the dispute became warm. The Eastern Church would not discontinue the celebration of the feast at the same time with the Jews; whilst the Western Church insisted upon celebrating it without the paschal lamb, and beginning it on Sunday, the day of Christ's resurrection. The uniform keeping of Easter was decreed by the Council of Nice in 325. It was ordained that Easter must be celebrated on the Sunday following the 14th day of the paschal moon; that the paschal moon is that moon of which the 14th day falls on, or next follows the day of the vernal equinox; that the 21st of March is to be considered the vernal equinox. The new moons are those of the ecclesiastical calender, which usually fall later than the true new moons. The practice of the Eastern Church was branded as heresy. From this time the keeping of Easter has been based on an artificial lunar cycle which was finally

perfected by the establishment of the Gregorian Calendar in 1582. (See CALENDAR.) The English name *Easter*, and the German *Ostern*, are most probably derived from the name of the feast of the Teutonic goddess *Ostera*, which was celebrated by the ancient Saxons early in the spring, and for which, as in many other instances, the first missionaries wisely substituted the Christian feast. Adelung derives *ostern* and *easter* from the old word *oster, osten*, which signifies *rising*, because nature arises anew in spring. This is also the derivation of *east*, in German *ost* or *osten*. Easter-fires, Easter-eggs, and many other customs and superstitions, have all their origin from the ancient heathen feast, which, as the celebration of the resurrection of nature, was very appropriately succeeded by the festival which commemorates the resurrection of Christ.

EASTER ISLAND, or DAVIS' ISLAND, an island in the South Pacific Ocean, lon. 109° 17′ w.; lat. 27° 6′ s. It is of a triangular form, one side about 12 miles long, the other two about 9 each. It has mountains sufficiently high to be seen at a considerable distance. The soil is fertile, but little cultivated. The sugar-cane, yams, sweet-potatoes, &c., are grown. There are some remarkable sculptures on this island, consisting of gigantic stone images in great numbers. The people are robust and of large size, and more European in appearance than most of the Pacific Islanders. Cannibalism is occasionally practised among them. Pop. 1500.

EASTERN EMPIRE. See BYZANTINE EMPIRE.

EAST INDIA COMPANY. From the earliest times the commercial enterprise of Europeans has been directed towards an immediate intercourse with the East Indies. The discovery by the Portuguese at the close of the fifteenth century of the long-sought route to India by the Cape of Good Hope gave a new impulse and direction to this enterprise, and in nearly all the leading nations of Europe steps were taken, either by the direct action of government, or by the formation of chartered and privileged companies, to participate in the advantages of the boundless commerce prospectively revealed in the opening up of this new ocean highway. Some account will be found of the principal companies thus inaugurated in our article COLONY. We here confine ourselves to the history of the greatest of them all, our own East India Company.

The English, in their first attempts to reach India, directed their course to the north-west, as the Dutch did to the north-east. In 1553 Edward VI. chartered a company, with a capital of £6000, which embarked on the career of discovery by equipping three vessels, which were despatched under the charge of Sebastian Cabot, for the discovery of a northern passage to India. This expedition, though failing in its original object, gave rise to commercial relations with the northern coast of Russia. After several other attempts to penetrate to India by land, and by the Cape route, a society was formed in London to prosecute a voyage to the East Indies, and from this humble beginning sprung the company which was destined to acquire the greatest power of any commercial association on record. This society, formed in 1599, with a subscribed capital of £30,133, 6*s.* 8*d.*, contributed by 101 subscribers of £100 to £3000 each, was evidently designed for a permanent enterprise, though proposing, as an immediate trial of its powers, only a single voyage. A charter was granted to the company by Queen Elizabeth on 31st December, 1600, for fifteen years, renewable for a similar period. In this charter the company is styled, 'The Governor and Company of the Merchants of London trading into the East Indies.' The number of persons incorporated in it is 218, more than double of the original number of subscribers. The trading limits assigned by the charter are 'all the islands, ports, havens, cities, creeks, towns, and places of Asia, Africa, and America, or any of them, beyond the Cape of Bona Esperanza to the Straits of Magellan,' with the exception of such places as are already in possession of any Christian prince in league or amity with the British crown who shall refuse his consent to such trade. The first voyages resulted in large profits, as much as 234 per cent. being realized on some. During this period, although the ultimate intention was probably to form a joint-stock company, only the general management of the undertaking was in common, each merchant venturing his own goods at his own risk. In 1604 James I. granted a license to Sir Edward Michelborne, a member of the Company, to trade to Cathaia, China, Japan, Corea, and Cambaya. Although these countries had not yet been visited by the Company, it considered this a violation of its charter, and being desirous, from the profits of its first voyages, of extending its operations, it sought a renewal of its charter, that it might not be hindered in raising funds by the suspicion that King James might not respect a charter granted by his predecessor. The charter was consequently renewed in 1609, with the additional power granted to the Company of seizing and confiscating ships and goods of contraband traders, either in the British dominions, or in any of the places where they were authorized to trade. The number of members included in this charter was 276. Instead of the fifteen years' duration, the charter was made perpetual, reserving the power to the crown of recalling it at three years' notice. This renewal of the charter was followed by a subscription for a sixth voyage, the largest that had yet been made, amounting to £82,000.

Among the motives which had induced the Company to press for this renewal of their charter was the necessity they had experienced from the jealousy of the Dutch and Portuguese to send out vessels fitted not only for trade, but for defence, and, perhaps, if the whole truth must be told, for attack. Accordingly, Captain Best, who commanded the eighth expedition, attacked four Portuguese war galleons, convoying 200 sail of merchantmen, off Surat, and gained a complete victory, which so impressed the Great Mogul that he immediately made a treaty with Captain Best, giving the English full liberty to trade in his dominions. This treaty was concluded on 6th Feb. 1613. It was followed at once by a resolution of the Company to trade on a joint-stock. £429,000 was raised as capital, and apportioned in fitting out four voyages for 1613, 1614, 1615, 1617. In 1617–18 the Company was so enlarged as to include 954 proprietors, while a new joint-stock of £1,600,000 was subscribed.

A remarkable event in the history of the Company now took place. These large subscriptions excited anew the jealousy of the Dutch. They had already, to some extent, conceded the right of traffic to the Company in the islands where they held the supremacy, but they regarded the great extension of its operations as a wholesale invasion of their privileges, and they determined, at least, to reserve a monopoly in the trade in spices from the Moluccas. Both parties appealed to King James, and at length a compromise was effected, and by a treaty concluded 7th July, 1619, a sort of alliance was entered into between the Dutch and English companies: the trading rights of the English company, without limit of capital, were acknowledged; purchases were to be arranged by common agents; the English were to have half the pepper and a third of the finer spices; new forts acquired in the Moluccas or elsewhere were to be jointly garrisoned; finally a committee of

defence, consisting of four members from each company, was created with large powers, and twenty warships placed at its disposal. The duration of the treaty was to be for twenty years. This treaty, which was probably not entered into very heartily on either side, was ill maintained, and ended in a tragical occurrence. Under the pretence of a conspiracy the Dutch authorities first tortured and then massacred the leading members of the English factory established under the treaty at Amboyna. When the news of this outrage, which occurred on 27th February, 1623, reached England, it excited the utmost indignation; but the feeble reign of James was drawing to a close, and was succeeded by the disastrous one of Charles I., and it remained unredressed, save that the commission appointed, in the time of Cromwell, to adjust the claims of the two companies, awarded £3615 to the heirs of the sufferers at Amboyna. The English Company, ill supported by the crown, was, during this period, often reduced to great straits. Their stations had often to be abandoned on account of the difficulties entailed by the oppressive character of Dutch rule, their trade became unprofitable, and their stock fell to a discount. To add to these difficulties, Charles I., in 1635, gave a license to a rival company of traders, which became known as Courten's Association. He charged the Company with attending only to their own profit, and neglecting to form permanent stations after the example of the Portuguese and Dutch. An attempt to form a new joint-stock failed, and a partial union with the new association was effected. Differences still remained, the new company advocating the old principle of private ventures, which came at length under the arbitration of Cromwell, who gave his decision in favour of a united joint-stock, and promised a new charter. The Company now proceeded to recognize their foreign establishments. A territorial footing had been acquired in Madras in 1640, to which settlement was given the control of all the factories in Bengal and the Coromandel coast, the supreme council in India still remaining at Surat. A new charter, granted by Charles II. in 1660, enlarged the powers of the Company, giving it political and judicial authority in the factories and colonies established by it, with the right to appoint governors. It also altered its constitution, which had hitherto given only one vote to each member, by giving a vote for each £500 of stock. In the reign of James II., as a natural fruit of these exaggerated powers, the Company openly adopted aggressive designs, and sent a fleet to India to effect a forcible occupation of Chittagong. But the time was not come, and their Indian servants were compelled to make a humiliating submission to Aurengzebe, who forgave their crime, and permitted them to resume their trade.

On the Revolution of 1688 the Company was involved in new difficulties. James II. had been their greatest patron, and they stood upon the precarious ground of a royal charter, while Parliament had now become the supreme authority of the land. To defend the liberty of trade a new company was proposed, and the Dutch and the French had already got nearly a monopoly of the Indian markets. They succeeded, indeed, in getting a new charter from the crown; but the Commons, in 1692, presented an address to the crown praying for their dissolution. At this time, by an accidental failure to pay a tax upon their stock, the Company formally forfeited their charter, and were compelled to accept its renewal with the important proviso of a reservation to the crown of the right to alter or modify its conditions. This proviso was taken advantage of to make several important alterations. The maximum stock to be held by any individual was fixed at £10,000, every £1000 of which was to give a vote, while the right of membership was thrown open to all British subjects. The opposition to the Company was not yet arrested, and they were still anxious to obtain parliamentary sanction; but a new difficulty arose, for, on the evidence of Sir Thomas Cooke, they were convicted of extensive bribery. Advantage was taken of those difficulties to inaugurate a new company in a quarter from which opposition was not anticipated. Scotland had hitherto been prevented by internal troubles from taking a direct share in the East India trade. The Scottish Parliament now sanctioned a company entitled the 'Company of Scotland tradeing to Affrica and the Indies,' with mercantile and political privileges at least as extensive at those of the English company. A list of 1219 shareholders, and a capital of £400,000, gave the new company a formidable start compared with the humble beginning of its established rival. The English Parliament openly and bitterly opposed this encroachment upon English trade. The king himself, after sanctioning the act of Parliament, did not dare to support his Scottish subjects; and the proceedings of the agents of the new company involved them in a war with Spain. Under these accumulated difficulties the Scottish company succumbed. Meantime the misconduct of the English company had so strengthened its enemies, that, in spite of all its opposition, a resolution in favour of the formation of a new company passed the House of Commons on 4th May, 1698, and this company was actually constituted by Act 9 William III. cap. xliv. This act provided for the extinction of the old company. One condition of the act, however, was fatal to the independent existence of the new company. Its whole capital of £2,000,000 was, by the act, pledged as a loan to the government. This and the foreign establishments held by the old company led to negotiations, and finally the two companies were amalgamated by Act 6 Anne, cap. xvii., under the title of the United Company of Merchants of England trading to the East Indies. By this act a new loan of £1,200,000 was taken from the Company. The charter was made terminable on three years' notice after 1726. The arrangements between the two companies were left to the award of Lord Godolphin, which was pronounced on 29th September, 1708. The possessions of the old company at the time of amalgamation, upon which the valuation of £330,000 was placed in 1700, include 'the ports and islands of Bombay and St. Helena, with all their rights, profits, territories, and appurtenances whatsoever;' under the presidency of Bombay are enumerated the factories of Surat, Swally, and Broach, where the Company have agents; and Amadavad, Agra, and Lucknow, where they have only buildings, &c. On the coast of Malabar are mentioned the forts of Carwar, Tellicherry, and Anjengo, and the factory of Calicut; in Persia the factories of Gombroon, Sheraz, and Ispahan; on the Coromandel coast, Forts St. George and St. David, with the surrounding territory; the factories of Cuddalore, Porto-Novo, Pettipolee, Melchilepatam (Masulipatam), Madapollam, and Vizagapatam; in Bengal, Fort-William, and the factory of Chuttanuttee and surrounding territories, the factories of Balasore, Cossimbuzar, Dacca, Hooghly, Moulda, Rajahmaul, and Patna. Possessions in Cochin-China, the island of Sumatra, &c., are also enumerated. A footing was thus already established in the three presidencies. The factory of Chuttanuttee or Chuttanee, the future site of Calcutta, had only been acquired by a formal grant in 1695, after the humiliating submission to Aurengzebe. Each of the three presidencies was organized under a president and council, with independent powers. The act of the United Company

had made some important alterations in its powers. The constitution of the Company was restored to its early footing, according to which each proprietor could exercise only one vote, the limit of stock to be held by each proprietor being withdrawn, and £500 again constituted the minimum entitling to a place in the court of proprietors. This led the larger proprietors to divide their shares among nominal holders, so as to increase their influence. The directors were elected annually, and as they held valuable appointments at their disposal corruption began to enter largely into the conduct of the elections. The dividends of the Company, however, rose rapidly after the amalgamation, and finally settled at 8 per cent.; and it procured without difficulty, at various periods, a prolongation of its exclusive privileges until 1780, still with three years' notice. In the meantime the French company (see COLONY) had, as well as the English, been growing in power and importance in the East, and on the outbreak of the war of the Austrian Succession in 1744 commenced those struggles which were destined to end in the establishment of British supremacy over nearly the whole of India. We do not purpose here to give an outline of events which involve nearly the whole history of India and a great part of that of Europe during the period of their occurrence, and shall confine ourselves to the history of the organization of the Company which had so large a part in them. It is curious, however, to note with what reluctance, when their struggles with the French and the zeal of their own servants had led them into collision with the native powers, this mercantile company embraced the destiny which was forcing on them the position of great territorial magnates. In their instructions to the Council of Madras in 1768, after intimating the limits they wish to keep in opposition to French ascendency, they say, 'If we pass these bounds we shall be led on from one acquisition to another till we shall find no security but in the acquisition of the whole, which, by dividing your force, would lose us the whole, and end in our extirpation from Hindustan.' 'It is not for the Company,' they add, 'to take the part of umpires of Hindustan.'

In 1766 the right of the Company to acquire territorial possessions formed, in consequence of recent acquisitions, a subject of parliamentary inquiry; and in the following year Parliament vetoed a resolution of the court of proprietors to raise their dividend to 12½ per cent. The question of the political rights of the Company being thus opened up, the ministry began to act on their view of it by sending out a crown plenipotentiary to India. After a protracted struggle at home and abroad, a regulating act was passed in 1773 remodelling the powers of the Company, and placing it completely under the control of Parliament. Instead of the twenty-four directors being elected annually, six were now to retire in rotation each year. £500 stock entitled a proprietor to attend the courts; £1000 gave one vote; £3000, two; £6000, three; and £10,000 or upwards, four votes. Provision was made to prevent the multiplication of votes by a fictitious distribution of shares. By this act the constitution of the councils of the presidencies was also regulated, and to the governor-general and council of Fort-William, in Bengal, was assigned the superintendence over councils of the presidencies of Madras, Bombay, and Bencoolen. The first members of the councils were named by the legislature, but future elections, after their term of office had expired, were left to the Company. The act provides for the establishment by the crown of courts of judicature in India. The charter, which expired in 1780, was renewed till 1791. The renewal act (21 George III. cap. lxv.) provided that the Company, which was already bound to submit to the government all despatches received from India, should submit for approval all despatches proposed to be transmitted thither. A further modification of the political power of the Company was effected by an act (24 George III. cap. xxv.), which received the royal consent on 13th August, 1784. This act established a board, since known as the board of control, to superintend, direct, and control all acts, operations, and concerns relating to the civil and military government or revenues of India. The board was to consist of a principal secretary of state, the chancellor of the exchequer, and four privy-councillors nominated by the crown. As the first two members seldom attended, the senior of the appointed members came ultimately to be designated President of the Board of Control. The directors of the Company were bound to submit all their papers to this board, and obey its instructions. Commercial matters were not to be submitted to the control of the board; and his majesty in council was to decide without appeal whether any matter was included in this exception or not. In matters relating to peace and war, and to diplomatic negotiations, the instructions of the board of control were to be communicated to a secret committee consisting of three members appointed by the directors, and who were to withhold all knowledge of these instructions from the rest of the court. From this time the political power of the Company was little more than nominal. While the right of nominating the servants of the Company was still left to the directors, the absolute right of recall was vested in the crown. A subsequent declaratory bill (28 George III. cap. lxxviii.) regulated the power of the board of control to send out troops at the expense of the Company. By act 33 George III. cap. lii. the exclusive trade and revenue privileges of the Company were continued to them for twenty-four years from 1st March, 1794. A concession was made to the opposition of the large towns to the continuance of a commercial monopoly, requiring the Company to allow annually a certain amount of their tonnage for the accommodation of private trade. This concession was not deemed satisfactory; and as early as 1808 a select committee of the House of Commons was appointed to enter into the terms on which a renewal of the charter might be recommended. At first the government were disposed, on condition of throwing open the export trade, to give the Company the benefit of their warehousing arrangements by confining imports to London; but petitions continued to pour in in favour of the entire opening up of the trade, and the directors were unwilling to concede even what was required of them. Finally the charter was renewed in 1813 for twenty years from 10th April, 1814, in regard to territorial possessions, but the right of exclusive trade was restricted to China, and the India trade was thrown open to all British subjects under the restrictions that it must be carried on in vessels of not less than 350 tons register, and that imports should be admitted only to ports certified by orders in council. A church establishment for India was also provided by this act. The appointment of governors-general, governors, and commanders-in-chief were no longer to be valid without the direct sanction of the crown.

The renewal of the Company's charter in 1834 took place amid continued opposition to their mercantile, and even to their legislative privileges. It continued them in all their possessions except the island of St. Helena, put an end to the exclusive right of trade with China, and enacted that the Company should with all convenient speed close their commercial business, and make sale of all their property not retained for government purposes; all their other property was to be held in trust for the crown, which

was to take over their debts and guarantee their dividend out of the revenues of India. The stock was valued at £6,000,000, which was to bear interest at 10 per cent., and be redeemable after 30th April, 1874, on payment of £12,000,000; but if the Company should be deprived by authority of Parliament of the possession and government of India, it might, at any time after 1854, demand redemption at a year's notice. £2,000,000 sterling was invested in the funds at compound interest, to secure the means of redeeming the stock. The Company was now fairly in liquidation. The anticipation contained in this act of an early close of its political existence was realized. On the outbreak of the mutiny of 1857 it was felt indispensable to vest the government of India directly in the crown. This was done in 1858, by act 21 and 22 Victoria, cap. cvi., by which the government of India and all the powers of the Company are assumed by the crown. Henceforth the Company has existed only for the purpose of receiving payment of its capital, and of the dividends due upon capital until its repayment. All the provisions regarding the security fund and the redemption of the dividend of the Company are left in force by this act. Several minor acts have since been passed to regulate the liquidation, or otherwise amend the provisions of this act.

The anomaly of a vast empire being governed by a mercantile company is almost unprecedented in history, and such an anomaly could not exist without opening the door to innumerable abuses. One of these, the corruption incident to the government of the Company itself, has been sufficiently indicated in this sketch. Another abuse, to which, in fact, the rise of our Indian Empire is in great measure due, was the almost unlimited power of the servants of the Company. On the spot, and familiar with the circumstances, these servants could not but frequently regard the instructions of their cautious and partially informed employers with contempt. They traded for themselves; they abused their power over the natives; and, finally, they embarked on a career of conquest, into which they were partly dragged by circumstances. In all these proceedings they were unrestrained by the fear of a powerful authority at home, which would have kept in check the servants of a regular government, so that both the good and the evil that have resulted from this peculiar domination would probably have been restricted within narrower limits, if not altogether prevented, by a more vigorous home administration. The monopoly of trade so long held by the Company, like all monopolies, tended greatly to restrict the extent of our eastern trade, and to enrich individuals at the expense of the public; while from the impossibility of controlling so vast a monopoly the wealth thus diverted from the ordinary channels of trade did not flow into those which the monopolists had prepared for it. The Company was frequently reduced to financial difficulties, and brought sometimes to the brink of ruin, while its servants were enriching themselves at its expense. These inevitable evils made the cessation of the Company's powers, both commercial and political, only a question of time; but it must not be forgotten, that to this extraordinary institution, aided indeed by events which were neither anticipated nor desired by its promoters, we owe our Indian Empire. The government of India has now been placed under a secretary of state, aided by a council of fifteen members, seven of whom were originally elected by the court of directors of the East India Company, and are replaced by election among the councillors themselves. The other eight are nominated by the crown. The majority of the council must be qualified by residence in India.

EAST INDIES, the name generally bestowed on those continents and islands to the east and south of the river Indus, as far as the borders of China, including Timor and the Moluccas, but excluding the Philippine Islands, New Guinea, and Australia.

EASTLAKE, Sir Charles Lock, President of the Royal Academy, was born at Plymouth, 17th November, 1793. He was for a short time a pupil in the Charterhouse, and entered the schools of the Royal Academy, where Haydon, a friend of his father, undertook his education. For a time he gave no great promise of future eminence. He was employed copying pictures in the Louvre when the commencement of the Hundred Days drove him to England, and he remained for some time in Plymouth occupied as a portrait-painter. Here, when the *Bellerophon* arrived, he made a most successful portrait of the emperor, who, as Eastlake thought, willingly gave him the opportunity by pausing at the gangway as he paced the deck. In 1817 he visited Italy with Sir Charles Barry and Brockedon. Here he executed a series of sketches of antiquity for his patron, Mr. Harman. He returned to England in 1820, and painted Paris receiving the Apple from Mercury, which did not attract much attention. He again visited Rome, and during his absence in 1823 sent three pictures, the Castle of St. Angelo, the Coliseum, and the Basilica of St. Peter's, for exhibition in the Academy. Several other pictures followed in 1825, which procured him the associateship of the Academy. Pilgrims Arriving in Sight of Rome and St. Peter's (1828) became so popular that the artist became tired of repeating it. Next year he returned to England, and in 1830 he was made an R.A. Christ blessing Little Children (1839) and Christ Weeping over Jerusalem (1841) were next among his noteworthy productions. Helena (1849), Ippolita Isrelli (1851), Violante (1853), are considered among his best works. He translated Goethe's Farbenlehre (1840), and published in 1847 Materials for a History of Oil-painting. He became president of the Royal Society in 1850, and member of the French Academy in Rome in 1858. He died at Pisa, 23d December, 1865.

EAU, a French word, signifying *water*, and used in English with some other words for several spirituous waters, particularly perfumes, as *eau de Cologne*, *eau de Luce*, *eau de Portugal*, &c. The two most celebrated are the—

Eau de Cologne, or water of Cologne, a fragrant water, made originally and in most perfection in Cologne. Formerly many wonderful powers were ascribed to this water, but it was probably never so much in demand as at present in Europe and America, and numberless recipes have been given for its manufacture. It was invented by a person named Farina, in whose family the secret, as they say, continues to be preserved, since chemistry has not been able as yet to give the analysis of it. It is imitated, however, everywhere. The consumption of this perfume has increased very much since the Seven Years' war; and there exist at present various manufactories of it in Cologne, which produce several millions of bottles yearly; much also is manufactured at Paris, in Saxony, and other places. One of the many recipes to make *eau de Cologne* is the following:—

Alcohol, or spirit of wine, at 30°	2 pints.
Oleum neroli	24 drops.
,, de cedro	
,, de cedrat	
,, cort. aurant.	
,, citri	
,, bergamotæ	
,, rosmarini	
Seed of small cardamum	2 drachms.

Distil it in the water-bath until three fourths of the alcohol have evaporated.

Eau de Luce (*aqua Luciæ*, or *spiritus salis ammoniaci succinatus*), invented by a person named Luce, at Lille, in Flanders; a volatile preparation, thus made: 10 or 12 grains of white soap are dissolved in 4 oz. of rectified spirit of wine, after which the solution is strained, and a drachm of rectified oil of amber is added, and the whole is filtrated. Afterwards some strong volatile spirit of sal ammoniac should be mixed with the solution. An imitation called compound tincture of ammonia or eau de Luce is prepared by macerating mastic in rectified spirit, and then shaking up the clear tincture with a little oil of lavender and stronger solution of ammonia. It is a milky fluid, powerfully antispasmodic, and stimulant. *Eau de Javelle* is the name given to the disinfecting and bleaching solution of chloride of potash.

EAUX-BONNES, a celebrated watering-place, France, department Basses Pyrénées, at the bottom of a narrow gorge, about 20 miles S.S.E. of Oleron and 25 south of Pau. The springs, which have a temperature of about 90°, are strongly impregnated with sulphur. They are used for bathing, and have great efficacy in affections of the chest, particularly in the early stages of consumption. The neighbouring scenery presents many attractions to visitors, of whom about 6000 to 10,000 resort hither in the course of the season, which lasts from June to October. Pop. 917.

EBAL, a mountain in Palestine, situated opposite Mount Gerizim, from which it is separated by a narrow valley containing the town of Nablous, anciently Shechem. Ebal is on the north of the valley, Gerizim on the south. Here the Israelites were commanded (Deut. xxvi. 1–26), on their entrance into the Holy Land, to set up an altar of hewn stones plastered with plaster, and to assemble six tribes upon Mount Gerizim and six upon Mount Ebal, the former to respond to the blessings, the latter to the curses pronounced out of the law. The fulfilment of this command is recorded in Jos. viii. 30–35.

EBB. See TIDES.

EBELMEN, JACQUES JOSEPH, was born at Baumes-les-Dames, in the department Doubs, July 10, 1814. After a brilliant career as a student in the École Polytechnique and École des Mines, he became, in 1849, professor of assaying in the latter school, and of céramique at the Conservatoire des Arts-et-Metiers. In 1847 he became director of the Sèvres porcelain-work. Under his management many improvements were introduced. His more important researches relate to the gases of the blast-furnace, to the formation of minerals, in the course of which he produced emerald, corundum, and some others, and from silicic ether prepared hyalite and hydrophane. He besides published numerous analyses of minerals; examined, with Salvétat, Chinese porcelain materials, and studied the phenomena of the decomposition of rocks under ordinary atmospheric conditions. He died at Sèvres, March 21, 1852. His papers were collected by Salvétat, and published in two volumes, in 1855.

EBENACEÆ, a natural family of exogenous plants, consisting of non-lactescent trees and shrubs, of which the wood is very hard, and frequently of very dark colour in the centre, as ebony. The leaves are alternate, and generally coriaceous and shining. The flowers are commonly axillar, rarely hermaphrodite, and mostly polygamous; the calyx is monosepalous and persistent, with three or six equal divisions. The corolla is monopetalous, with imbricated divisions. The stamina are usually double or quadruple in number of the divisions of the corolla. The ovary has several cells, containing each one or two pendent ovules; the style is divided, the stigmas simple or bifid. The fruit is a globular berry, containing a small number of compressed seeds. The principal genera are *Diospyros*, which yields ebony and iron-wood (see EBONY), *Royena*, to which the shrubs known as the African bladder-worts belong, and *Paralea*.

EBENEZER (Hebrew, the stone of help), the name of a field where the Philistines defeated the Hebrews, and seized on the sacred ark, and where afterwards, at Samuel's request, the Lord discomfited the Philistines with thunder, &c. On this occasion Samuel set up a stone, and gave it this designation, to indicate that the Lord had helped them. It is said to be about 40 miles south-west of Shiloh. The name of *Ebenezer* has been given to several places in the United States.

EBIONITES, a sect of the first century, so called from their leader, Ebion. They held several dogmas in common with the Nazarenes, united the ceremonies of the Mosaic institution with the precepts of the gospel, observed both the Jewish Sabbath and Christian Sunday, and, in celebrating the Eucharist, made use of unleavened bread. They abstained from the flesh of animals, and even from milk. In relation to Jesus Christ, some of them held that he was born, like other men, of Joseph and Mary, and acquired sanctification only by his good works. Others of them allowed that he was born of a virgin, but denied that he was the Word of God, or had any existence before his human generation. They said he was, indeed, the only true prophet; but yet a mere man, who, by his virtue, had arrived at being called *Christ*, and the *Son of God*. They also supposed that Christ and the Devil were two principles which God had opposed to each other. Of the New Testament they only received the Gospel of St. Matthew, which they called the *Gospel according to the Hebrews*.

EBONITE, or VULCANITE, differs from ordinary vulcanized caoutchouc only in the larger proportion of sulphur it contains—from 30 to 60 per cent., and in the higher temperature at which it is made; but inferior qualities are produced by the addition of bitumen, heavy-spar, shell-lac, and other impurities. It has a brownish-black colour, is hard and tough, it cuts easily and takes a good polish, is therefore very largely used for making into combs, brooches, bracelets, and a great number of other ornaments. It is not affected by water or by any of the usual caoutchouc solvents. As it becomes strongly electro-negative by friction, it has been much used in the construction of electric machines.

EBONY, a kind of wood, extremely hard, and susceptible of a very fine polish, which is much used in mosaic, inlaying, and other ornamental works. Its colour is red, black, or green. The black is most esteemed, and is imported principally from Madagascar, Mauritius, and Ceylon. *Red ebony*, so called, though its colour is brown striped with black, is less compact, and is also brought from Madagascar. The green is softer than either of the preceding, yields a fine green tincture, which is employed in dyeing, and is brought from the West Indies, particularly from Tobago, as well as from the above-mentioned islands. The best is jet black, and free from knots, or reddish veins. Ebony is imitated by subjecting some hard kinds of wood, especially that of the pear-tree, to a hot decoction of galls, and, when this is dry, applying ink with a stiff brush; a little warm wax is then used to give it a polish; another method is by heating and burning the wood. The ebony-tree (*Diospyros ebenus*) grows wild in the East Indies, and has been cultivated for many years in Mauritius, which supplies a great part of that consumed in Europe. The central part, or heart-wood, only is black; the sap-wood does not differ in colour from that of other trees. Several other species of the genus afford

ebony, among them *D. decandra* and *dodecandra* of Cochin-China, which are used in that country for cabinet-work, &c. The ebony which the Greeks used in the most ancient times was procured from India; but it was unknown in Rome till after the victories obtained by Pompey over Mithridates. The ancient inhabitants of India, the Greeks, and finally the Romans, made frequent use of this fine wood, inlaying it with ivory, on account of the contrast of colours. According to Pliny, the statue of Diana at Ephesus was of ebony, but according to Vitruvius, it was of cedar. Artists and poets used ebony allegorically for the attributes of the infernals, giving a throne formed of it to Pluto and Proserpine, and making the gates of hell of the same dark and durable material. It is used at the present day for sculptural decorations, embellished and inlaid with ivory, mother-of-pearl, silver, and gold.

EBRO (Latin, *Iberus*), a river in Spain, once the boundary between the territory of Rome and Carthage, has its source in the province of Santander, 10 miles W. by N. of Reynosa. Pursuing a south-east course it separates Biscay and Navarre from Old Castile, intersects Aragon and the south-east portion of Catalonia, and falls into the Mediterranean by two mouths in lat. 40° 40′ N., after a course, including windings, of nearly 500 miles. It is navigable for boats up to Tudela, about 180 miles from its mouth, but is obstructed by shoals and rapids, to avoid which a canal, about 100 miles long, has been constructed south of and nearly parallel to the river.

EBULLITION. In ordinary language the term ebullition, or boiling, is applied to the commotion accompanied by escape of vapour which takes place when a fluid, such as water, is heated. But the escape of vapour from water depends not merely upon the temperature, but upon the presence of gases and other bodies, upon the vessel, and a variety of circumstances, so that a strict definition is necessary. The usual statement is that ebullition is the conversion of a liquid into a vapour or gas having the same tension or elastic force as the air. This conversion takes place at different temperatures for different substances, but it is so constant for each substance that the fixity of the boiling-point of a fluid is regarded as a very good test of its purity. In determining what that point is, it is of course necessary to ascertain what the atmospheric pressure is, to see that it does not vary during the experiment, and to fix upon some standard pressure for comparison of results. The pressure is estimated by the barometer, the standard length of the mercurial column being 30 inches (on the Continent 760 millimetres, or 29·922 inches). Accordingly, when aqueous vapour has an elastic force sufficient to balance a mercury column of this length, the water from which it issues is said to be in a state of ebullition, and this is what takes place at the temperature of 212° F. If now the pressure be diminished, the temperature required also falls, so that on the top of Mont Blanc the boiling-point falls to 182° F., and in a vacuum to 70° F. Strong spirit of wine, at the standard pressure, boils at about 175° F., chloroform at 142° F., bisulphide of carbon at 122° F., ether at 95° F., hydrofluoric acid at 68° F., chloride of ethyl at 55° F., liquid sulphurous acid at 14° F., that is, 18° below the melting-point of ice. At the ordinary temperature, therefore, sulphurous acid is a gas, and it requires but a slight alteration of temperature or pressure to change some of the liquids just mentioned into gases. See HEAT.

ÉCARTÉ, a game at cards for two persons. It is of French origin, and the terms used in it are generally French. It is sometimes played differently in this country from the French mode, but the differences are not material. The game is played with a piquet pack, that is thirty-two cards, the small cards, from two to six, being excluded. For convenience of dealing, two packs are generally used. The players cut for the deal; the lowest card (in France the highest) deals. The dealer gives five cards to each player, three and two at a time, and turns up the eleventh card as trump (French, *atout*). If the turn up is a king he scores one, and if a king turns up in the hand of either player the holder may score one, but in each case this must be announced before the first trick by saying, 'I mark king.' The king is the highest card, the queen next, then knave, ace, ten, &c. Trump takes all other suits. In playing the non-dealer leads; the other player must follow suit, and take the trick if he can; if he cannot follow suit, he must play trump, if he holds one. The winner of the trick leads again till the five tricks are exhausted. Three tricks count one point, five tricks (in French, *vole*) two points. Five points make a game. The player, according to the French game, must announce the suit he plays, and if he plays differently, can be compelled to play as he announces, or if he cannot, as his adversary pleases. The leading speciality of the game, from which it derives its name, is, that before beginning to play the non-dealer may claim to discard (*écarter*), that is, to set aside any of his cards with which he is dissatisfied, and have their place supplied with fresh ones from the pack. When this claim is made, by saying in English, 'I propose,' or in French, 'je propose,' 'je demande,' 'si vous voulez,' the dealer may either accept or decline. If he accepts, he says, 'How many?' (combien?) His adversary then names the number of cards he wishes to exchange, which the dealer hands him from the pack, the discarded cards are set aside on the left hand of the player. The dealer has then the privilege to set aside as many cards as he pleases, dealing himself new ones from the pack. If the elder hand (non-dealer) is not satisfied, he can claim another discard, which gives a similar privilege to the dealer, and so on till the pack is exhausted. The discarded cards can on no account be recalled, except that when one player has claimed a discard, and there are not cards enough left to allow the other player to discard, he may draw the number of which he is deficient from his own discarded cards. When the pack is exhausted, the game proceeds as already explained, and this is also done when either player declines a further discard; but in this case, whether the non-dealer declines to ask the discard or the dealer to grant it, the other player scores double for his tricks. The penalties and the mode of discarding sometimes vary from that here explained. In this country only one discard is sometimes allowed to each player, and in France the penalty is mitigated to one point, if he loses the odd trick after refusing any discard but the first. The game is usually played in rubbers.

ECBATANA, the chief city or ancient metropolis of Media, built, according to Pliny, by Seleucus. It was the summer residence of the Persian and Median kings, and existed in great splendour at a very early period in the history of the world. Its walls are described by ancient writers in a style of romantic exaggeration, and particularly by Herodotus and the author of the book of Judith. Daniel is said by Josephus to have built one of its most magnificent palaces, some of the beams of which were of silver, and the rest of cedar plated with gold. This splendid edifice afterwards served as a mausoleum to the kings of Media, and is affirmed, by the last-mentioned author, to have been entire in his time. There are no traces now remaining of these lofty buildings; and even the site of this cele-

brated city has become a subject of dispute among modern travellers. It was pillaged by the army of Alexander.

ECCE HOMO (Latin, Behold the man!) This name is often given to crucifixes and pictures which represent the suffering Saviour, because, according to John xix. 5, Pilate broke out in these words when Jesus came forth wearing the crown of thorns and the purple robe.

ECCHYMOSIS is the medical term applied to the extravasation of blood beneath the skin, or in the tissues of the body, whether resulting from a bruise or any other cause.

ECCIUS. See ECK.

ECCLESIASTES, one of the canonical books of the Old Testament. It is professedly written by Solomon, but its authorship has been questioned by Grotius and later critics. It is said to contain Aramaic words, and consequently to belong to a later period. The Sadducean theories of the book, and other objections, are likewise urged against its early origin. The critics, however, who object to the professed origin of the book have been unable to agree in fixing the period of its production, and perhaps the same methods of criticism might suffice to raise doubts as to any other origin that might be assigned.

ECCLESIASTICAL COMMISSIONERS, FOR ENGLAND, are a body corporate with a common seal, perpetual succession, and power to hold real estate, constituted by act 6 and 7 Will. IV. cap. lxxvii., 3 and 4 Vict. cap. cxiii., and 13 and 14 Vict. cap. xciv. It consists of all the bishops of England and Wales, the deans of Canterbury, St. Paul's, and Westminster; the chief-justices and other legal dignitaries, and several lay members. It has extensive powers in regard to the organization of the church, the distribution of episcopal duties, revenues, &c. The schemes adopted by the commission, on being laid before her majesty in council, approved of, and gazetted, acquire the force of acts of Parliament.

ECCLESIASTICAL CORPORATIONS (English law), corporations created for the furtherance of religion, and for the perpetuation of the rights of the church, the members of which are exclusively spiritual persons. They are of two kinds: corporations sole, viz. bishops, deans in peculiar, parsons, and vicars; and corporations aggregate, viz. deans and chapters. The ordinary is their visitor by common law. The crown, as supreme ordinary, is the visitor of the metropolitan or archbishop, the archbishop is the visitor of all his suffragan bishops, and the bishops of all the spiritual corporations in their dioceses.

ECCLESIASTICAL COURTS OF ENGLAND are the Archdeacon's Court, the Consistory Courts, the Court of Arches, the Court of Peculiars, the Prerogative Courts of the two archbishops, the Faculty Court, and the Privy Council, which is the court of appeal.

ECCLESIASTICAL DIVISIONS OF ENGLAND. England is divided ecclesiastically into provinces, dioceses, archdeaconries, rural deaneries, and parishes. The provinces are two, Canterbury and York; the bishoprics (besides the two archbishops) are twenty-six, viz. London, Durham, Winchester, Bangor, Bath and Wells, Carlisle, Chester, Chichester, Ely, Exeter, Gloucester and Bristol, Hereford, Lichfield, Lincoln, Llandaff, Manchester, Norwich, Oxford, Peterborough, Ripon, Rochester, St. Asaph, St. David's, Salisbury, Worcester, Sodor and Man. Each bishopric is subdivided into archdeaconries, &c.

ECHALOT, or SHALLOT (*Allium ascalonicum*), a kind of onion, a native of Syria, but which has been cultivated in Europe for some centuries. The bulbs are pungent, but of an agreeable taste, and much used in cookery.

ECHARD, LAWRENCE, an English divine and historian of the last century. He was born in Suffolk in 1671, and studied at Cambridge. He died in 1730. Among his works are, The Roman History, three vols. 8vo; A General Ecclesiastical History, two vols. 8vo, both works extending only to the age of Constantine; A History of England to the Revolution, three vols. folio; The Gazetteer's or Newsman's Interpreter.

ECHELLES, LES, a village, France, department of Savoie, on the right bank of the Guier, 12 miles south-west of Chambery. Pop. 798. The valley beyond the village is closed by a limestone rock 800 feet high. Originally the only mode of egress was to climb the precipice by means of ladders fastened to it, but a public road now passes through the precipice by a tunnel 25 feet in width and height, and nearly 1000 feet in length.

ÉCHELON (French, a ladder or stairway), used in military language. A battalion, regiment, &c., marches *en échelon*, or *par échelon*, if the divisions of which it is composed do not march in one line, but on parallel lines. The divisions are not exactly behind each other, but each is to the right or left of the one preceding, so as to give the whole the appearance of a stairway. This order is used if the commander wishes to bring one part of a mass sooner into action and to reserve the other. If the divisions of the *échelon* are battalions, these are generally from 100 to 200 steps from each other. An *échelon* is said to be *direct* if its head maintains a position perpendicular to the original line, as in direct attack or retreat; it is said to be *oblique* when it deviates from the line, as in changing the order of formation.

ECHENEIS, a genus or family of fishes, order *Malacopterygii sub-bracchiati*. Their speciality consists in having a disc on the head formed of transverse cartilaginous laminæ, sloping backwards, and with spines on their posterior edge. By this disc the fish can attach itself firmly to a solid object, as it frequently does to a rock or the bottom of a ship. The body is long and scaly, with a small dorsal fin opposite the anal; the head is flat, with a projecting lower jaw and small teeth. *E. remora*, the common *remora* or sucking-fish, is abundant in the Mediterranean, where they frequently attach themselves to the bottom of vessels. The ancients attributed to them marvellous powers in arresting the motion of vessels. It was believed to be owing to one of them that Antony's ship was prevented from getting into action at the battle of Actium. They frequently attach themselves to other fish.

ECHIDNA, or porcupine ant-eater, an animal formerly referred to the same group of mammals to which sloths, ant-eaters, and armadilloes belong, but now placed among the Ornithodelphia, showing, like the duck-mole (*Platypus*), certain curious resemblances to the birds. It has a globular skull, the thin, hard bones of which are early united, as in the bird, so that all trace of sutures has disappeared; the slender, elongated muzzle is naked and toothless. The bones of the shoulder and clavicle are arranged, not as in other mammals, but after the plan of birds and reptiles; and, as in these groups, the cavity which receives the head of the thigh-bone is incompletely ossified in the centre. The pelvic organs open, as in birds, into a cloaca or common chamber with the intestines. The cochlea of the ear is not coiled, but bent on itself, as in some birds. These remarkable departures from the mammalian type have been explained on the hypothesis that the Ornithodelphia are descendants from the same stock as that from which birds and reptiles were an offshoot. The Echidna is found only in New South Wales and Tasmania, and it is doubtful if the inhabitants of these two localities

are distinct species, or only varieties, the *E. hystrix* of Australia having long spines and short hair, and being of a darker colour than *E. setosus*, the Tasmanian form, which has short spines and more abundant longer hair, the spines being also whiter; the latter is by some thought to be a variety adapted to the colder climate of the more southerly locality. The animal is about the size of a hedgehog; it has powerful digging feet, and burrows with rapidity; its food is insects, and these are obtained by thrusting the long slender tongue, which is covered with a viscid secretion, among its prey, just as the ant-eaters do. It is remarkable that all the insectivores with such long worm-like tongue (*vermilingues*) are confined to the southern hemisphere, and that the insect-eaters of Australia, the Echidna and Myrmecobius (the latter a marsupial animal), are confined to the southern part of the continent.

ECHINODERMATA. The animals included under this class are very dissimilar, the nearly spheroidal sea-urchin, with its hard calcareous test, standing at one end of the series, the disc-like star-fish in the middle, and at the other end the worm-like soft-bodied Holothurian, the sea-slug, species of which form the tripang or *bèche de mer*, a favourite food in the Pacific area. The star-fish and sea-urchin are the most familiar examples. The common cross-fish of our shores consists of five rays, whose bases form an acute angle with each other, the central portion or disc not being sharply defined. The upper surface has the integument flexible, with small calcareous particles scattered here and there: the under surface shows the arms to be traversed each by a groove, the five being radially disposed round the central mouth. The whole animal thus consists of two equal portions, the characteristic appearances being confined to the upper and lower surfaces. From the five grooves delicate tubular bodies project, terminating in a flattened disc; these are the ambulacral feet, which are alternately erected and allowed to collapse, being filled with water from a vascular system in the interior, which communicates externally by the madreporiform tubercle, a small perforated calcareous plate which may be seen on the upper surface of the body. Taking this tubercle and the mouth as convenient marks for the two surfaces, which may be called aboral and oral, the sea-urchin may be easily compared with the cross-fish. The mouth and tubercle are placed at what may be called the oral and aboral poles of the nearly spherical body, and in the living animal the ambulacral feet may be seen projecting no longer on the under surfaces of rays, but along five bands, which, from the resemblance to a terrestrial globe, may be called meridional. But these bands do not reach the pole; they leave around it an area which is the equivalent of the whole upper surface of the star-fish. The same excess of the ambulacral or oral surface over the aboral or antambulacral is seen in the Holothurians. The radial aspect is the first point which strikes the observer; but this arrangement is not fully carried out in the interior. The stomach of the star-fish is in the centre of the body above the mouth, and is prolonged by coecal processes into the arms, the genital organs occupying the space beyond their extremities; there is only one aperture to the digestive canal. But in the sea-urchin the intestine is spirally wound round the inner surface of the shell, and the vent opens at the apex of the shell. In the Holothurians it is likewise non-radial, as are also the reproductive organs. The nervous system consists of a ganglionated ring around the mouth, whence fibres follow the course of the ambulacral grooves. The water canals consist of an annular vessel surrounding the œsophagus, and of an axial trunk connecting this vessel with the madreporiform tubercle through which water filters into the canals. From the annular vessel trunks pass off and traverse the ambulacral lines, giving off on the one side the dilatable feet, on the other certain pear-shaped sacs by which the movements of the water are regulated, emptying as the feet are distended and conversely. A true vascular system exists in most adult Echinoderms, and follows the disposition of both alimentary and ambulacral systems. The skeleton consists of calcareous matter, which is either granular or spicular, as in some star-fishes and Holothurians; or consists of plates fitted into each other with wonderful regularity, as in the sea-urchins; nor is it confined to the integument: the internal canals and vessels also have calcareous matter deposited in their walls, and the patterns of these structures are often of value in identifying the animals whence they come. The integument further is set with *spines*, which are articulated to the skeleton of sea-urchins; with *pedicellariæ*, or stalked organs, consisting of articulated calcareous plates which fold together pincer-like; or with *paxillæ*, brush-like tufts, whose functions are uncertain. But the most interesting of the hard parts is the lantern of Aristotle, a beautiful composite structure of radial character, which acts as a masticatory organ. It consists, in the urchins, of ten pieces united in pairs, so that each pair lodges in its hollow a slender calcareous rod of fine texture, and resembling the incisor tooth of a rabbit. Accessory pieces of various forms make up the number of parts to twenty-five, and the pyramidal mass is protruded, the points separated so that when they are approximated the five teeth cut out a conical piece. Because of their radial aspect the Echinoderms were placed among the Radiates of Cuvier, but the peculiarity of their development brings them into relationship with the thread-worms, tape-worms, and the other forms grouped under *Scolecida*, which, with Echinoderms, now make up the sub-kingdom *Annuloida*. The embryos are, in fact, bilateral, the cilia by whose action they at first roam about becoming restricted to certain bands which are symmetrically arranged. When the body is projected into processes, these also are symmetrically disposed. Within this larva, which in some groups, as the sea-urchins, acquires a calcareous skeleton, a complete intestinal canal is developed, which lies in the axis of the body, but its two apertures curve towards the ventral surface of the body. No other organs are seen. On one side of the dorsal surface of the body a depression takes place, whose walls thicken so as to form a mass of blastema, out of which the body of the adult is developed, while the depression becomes the ambulacral canal, with its ramifications. The new growth or blastema gradually enlarges and surrounds the larval intestine, which it appropriates, a new mouth and vent being formed, while those of the larva are either cast off with the rest of the larval skeleton, or, like it, slowly disappear by absorption. This remarkable process of secondary growth is wholly distinct from a sexual process. The form of the larvæ and the details of the changes are of value in classification. The Echinoderms are divided into eight orders, characterized as follows: 1. *Echinoidea*, the sea-urchins, whose body is spheroidal or discoidal, and built up of calcareous plates suturally united to each other, which form ten meridional bands, five being imperforate, and the alternate five perforated, to give outlet to the ambulacral feet. The larvæ are pluteiform, and have a skeleton. 2. *Asteridea*, or star-fishes. The flattened body is stellate, the rays uniting at various angles so as to form a pentagonal disc, or a deeply cut star, having the mouth in the middle of one surface. The ambulacra are confined to and occupy the whole of that surface of the arms. The larvæ are vermiform, and have no

skeleton. 3. *Ophiuridea*, or sand stars. The body is a depressed, well-defined disc, from distinct points of which the arms are given off, and these are of different structure from the disc, consisting of vertebral ossicles surrounded by four plates, of which the ventral one covers the ambulacral vessel. The pluteiform larvæ have a skeleton. 4. *Crinoidea*, or feather stars. The rosy feather star, *Antedon* (*Comatula*) *rosacea*, and the *Pentacrinus*, or stone-lily, are the living representatives of the encrinites of older geological periods. The cup-shaped disc is supported on a longer or shorter stalk, which may be free or attached: the mouth is situated in the centre of the upper surface, opposite to the insertion of the stalk. The arms are composed of articulated plates, and give off lateral pinnules, which support the genital organs. The free-swimming larvæ develop within their bodies the ultimately stalked adult. 5. *Holothuridea*, or sea-slugs. The larva and adult are vermiform, and both want a skeleton, the adult having only calcareous spicules scattered in the skin. The ambulacral tubes pass from the oral to the aboral end. The wholly extinct orders are: 6, the *Cystidea*, which consist of a cup formed of suturally united plates, and supported on a stalk; at the apex of the ovoid body is a small aperture, and at one side a large one exists, closed by pyramidal plates; 7, the *Edriasterida*, which were not stalked; five ambulacral grooves radiated from the central mouth; 8, the *Blastoidea* were stalked, had ambulacra of complex structure, and apertures of unknown function between each pair. The anatomy of these three groups is still subject of discussion.

ECHINUS, SEA-URCHIN, or SEA-EGG, a marine animal, the type of an order and a family of the class Echinodermata, inhabiting the seas of most countries, and subject to great variety in the species. *Echinus esculentus*, the edible sea-egg, is common on the coast of Europe, and is esteemed as an article of food. In systematic arrangements the genus *Echinus* of Linnæus has been much divided, and is at present restricted to those species which have an orbicular, oval, or globular body, covered with spines, articulated on imperforate tubercles. These spines are very slightly attached, and fall off the dead animal on the least friction; in consequence, the specimens which commonly come under observation are deprived of them entirely. Five ranges of pores diverge from the centre, and tend towards the summit, dividing the shell into well-marked sections. The mouth is situated on the inferior surface, in the centre, and is armed with five osseous pieces or plates; anus superior. Many species are ornamented with a profusion of long and pointed spines, while in others they are quite short. These spines assist in locomotion, but the chief work is done by the ambulacral feet. (See ECHINODERMATA.) The apparatus of the mouth is provided with strong muscles, and is well calculated for crushing the hard portions of the animal's food. In the same species the colours vary considerably, the traits changing, however, on the death of the animal. Echini are said to retreat to deep water on the approach of a storm, and preserve themselves from injury by attaching themselves to submarine bodies. *E. melo* is perhaps the largest species known, and is found not uncommonly in the Mediterranean. Many fine species have been discovered in a fossil state imbedded in chalk, &c., in beautiful preservation. See ECHINODERMATA.

ECHO, a nymph (one of the Oreads), who, according to fable, was changed by Hera (Juno) into a rock, because her loquacity prevented Hera from listening to the conversation of Zeus with the nymphs. The use of her voice, however, was left her so far as to be able to repeat the last word which she heard from others. Another account is that Echo fell in love with Narcissus, and because he did not reciprocate her affection she pined away until nothing was left but her voice.

ECHO. Echoes are caused by the reflection of sound-waves at some moderately even surface. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. Even clouds are capable of producing echoes, as is observed at sea when a gun is fired off under a dense cloud. Echoes from the clouds also, in all likelihood, play an important part in the long rolling of thunder. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point of issue. To make a distinct echo the reflected sound must be concentrated rather than diffused. To this result a degree of concavity in the reflecting body is conducive. If the sound is repeated several times, which is the case when it strikes against objects at different distances, many echoes are heard. The reflecting surface must be at a certain distance, in order that the echo may come to the ear after the sound, and be distinctly separated from it. Sound travels about 1100 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. This is called a *polysyllabic* echo. If the distance is less, the echo repeats fewer syllables; if only one is repeated, then the echo is monosyllabic. The most practised ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than 60 feet is needed to enable a common ear to distinguish between the echo and the original sounds. Echoes at least distances, as from the walls of churches and public halls, are liable to mix with and destroy the distinctness of the original sound. Any object at a sufficient distance on which a sound may strike and be reflected directly to its source will cause an echo; but the most imposing echoes are produced by combinations of such reflecting surfaces, by which sounds are concentrated and repeated. Woods, rocks, and mountains produce natural echoes in every variety, for which particular localities have become famous, and with which superstitious legends are often associated. The open walls of ruined and empty buildings likewise become famous for echoes, and in this as well as other ways become haunted with good and evil spirits. An ancient echo has always something venerable about it, and whether natural or artificial never fails to inspire respect.

ECIJA, a town of Spain, Andalusia, on the left bank of the Genil, here crossed by a handsome bridge, 42 miles E.N.E. Seville. It is of very ancient origin, and according to tradition was visited by the apostle Paul. At a very early period it became an episcopal see, and its importance under the Romans is attested by many ancient remains. It is surrounded by a dilapidated wall, and is in general poorly built, but has two magnificent palaces, several churches gaudily decorated, though of little architectural merit, and some fine shady walks, particularly acceptable in a climate so hot that it has been called the oven of Andalusia. Pop. 23,722.

ECK, JOHANN MAYR VON, the celebrated opponent of Luther, was born in 1486 at Eck, a small place in

Swabia, where his father was bailiff. Possessed of good talents, he early obtained, by the study of the fathers and schoolmen, a degree of learning and skill in disputation, which afterwards Luther and Melancthon themselves could not deny. He was Doctor of Theology, canon in Eichstädt, and pro-chancellor of the University of Ingolstadt, where for the first time, in 1518, he drew up, in opposition to Luther's theses, his Obelisci, which he had composed only for private use, at the request of the Bishop of Eichstädt. Being engaged by this production in a discussion with Karlstadt, he met Luther in 1518 at Augsburg, and arranged that the question should be decided by a public disputation with Karlstadt at Leipzig, but his vanity could not be satisfied without bringing Luther into the quarrel, and he accordingly attacked several of Luther's views in his programme for the disputation. The consequence of this learned tourney, which lasted from 27th June to 16th July, 1519, and in which Eck only proved himself a very clever debater, was a series of keen polemical tracts between him on the one side, and Luther and Melancthon on the other. Eck anathematized the Wittenbergers as Lutherans; and then, partly from personal hatred and partly at the instigation of Fugger, proceeded in 1520 to Rome to solicit strong measures against them. He returned with a condemnatory bull against Luther, and with permission to publish it, but met with violent opposition in many places, and in particular at Leipzig was forced to take refuge in the Pauline monastery. In 1530 he attended the diet of Augsburg, and there, in presence of Duke William of Bavaria, made the remarkable admission that he could confute the Augsburg Confession by the fathers, but not by the Scriptures. He took part in the refutation drawn up by the Roman Catholics, and also in the attempts made at this diet to bring about a reconciliation. These proved as fruitless as those afterwards attempted at the diets of Worms in 1540, and Ratisbon in 1541, at both of which Eck was present. He died in 1543. The desire to shine and play a conspicuous part appears to have been the strongest feature in his character. He is also suspected, from his connection with the Fugger family, to have been influenced by mercenary motives.

ECKHEL, JOSEPH HILARY, a learned Jesuit, who distinguished himself greatly by his works on coins, medals, and other remains of classical antiquity. He was born at Enzersfeld, in Austria, in 1737. After becoming a member of the society of St. Ignatius he was appointed keeper of the imperial cabinet of medals and professor of archæology at Vienna. He died in 1798. Eckhel may be regarded as the founder of the science of numismatics, the principles of which are elaborately developed in his treatise, entitled, Doctrina Nummorum Veterum (eight volumes, folio, 1792–98). He also published catalogues of the ancient coins and gems in the imperial cabinet, and other learned treatises.

ECKMÜHL, a village of Bavaria, circle of Lower Bavaria, on the Gross Laber, 13 miles S.S.E. of Ratisbon, the scene of a sanguinary battle between the French and Austrians, on 22d April, 1809. Austria had taken advantage of the occupation given by Spain to the arms of Napoleon to recommence the struggle against French ascendency, which she had been compelled to abandon by the disastrous defeat of Austerlitz. On the 9th of April, immediately after the declaration of hostilities, the Austrian troops crossed the Inn and occupied Munich. The French, who had Bavaria, Saxony, and Würtemberg in their alliance, were posted chiefly at Ratisbon, Ulm, and Augsburg, with their head-quarters at Strasburg. Napoleon, who, in anticipation of this event, had returned from Spain, arrived on 18th April at Ingolstadt; on the 20th he defeated the Archduke Louis at Abensberg. On the same day the Archduke Charles took Ratisbon, which Davout had abandoned in order to join Napoleon, and moving along the right bank of the Danube, took up a position at Eckmühl. Napoleon pursued the Archduke Louis to Landshut, while Davout was engaged in a desperate attack upon the main army of the Austrians at Eckmühl. Advised by this general of the position of affairs, Napoleon turned upon the Archduke Charles, who sustained a decisive defeat, being cut off from the road to Vienna, and forced to retreat to the Upper Palatinate, while Napoleon advanced upon the Austrian capital, which surrendered on the 12th of May. Davout, who had sustained the brunt of the battle, was created Prince of Eckmühl.

ECLECTICS (from the Greek *eklektikos*, select, from *eklegō*, to select) is a name given to all those philosophers who do not follow one system entirely, but select what they think the best parts of all systems. Their philosophy is called *eclectic*, and their method *eclecticism*. In the history of philosophy this term is chiefly applied to that sect of Greek philosophers who strove to unite and reconcile the opinions of Pythagoras, Plato, and Aristotle, and to bring them into one harmonious system. The Roman philosophy never got beyond the stage of eclecticism. Cicero, the most important of their philosophical writers, was not an independent thinker, but merely an able expounder of the views of preceding writers, such as Panætius and Poseidonius. In France, since the beginning of the present century, the term *eclecticism* has been applied to the philosophic method of Royer Collard and Victor Cousin, who endeavoured to correct the sensualistic tendency of the school of Condillac and Locke, then prevalent in France, by a return to the older philosophy of Descartes and Malebranche, and by appropriating from the philosophy of the Scottish and German schools everything kindred to that system of thought.

ECLIPSE.

An Eclipse of the Moon is a privation of the light of the moon, occasioned by an interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is in opposition that it can come within the earth's shadow, which must always be on that side of the earth which is from the sun. The earth being in the plane of the ecliptic, the centre of its shadow is always in that plane; if, therefore, the moon be in its nodes, that is, in the plane of the ecliptic, the shadow of the earth will fall upon it. This shadow being of considerable breadth is partly above and partly below the plane of the ecliptic; if, therefore, the moon in opposition be so near one of its nodes that its latitude is less than half the breadth of the shadow, it will be eclipsed. But because the plane of the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it will frequently have too much latitude at its opposition to allow it to come within the shadow of the earth.

An Eclipse of the Sun is an occultation of part of the face of the sun, occasioned by an interposition of the moon between the earth and the sun; thus all eclipses of the sun happen at the time of new moon. The dark or central part of the moon's shadow, where the sun's rays are wholly intercepted, is called the *umbra*, and the light part, where only a part of them are intercepted, is called the *penumbra;* and it is evident that if a spectator be situated on that part of the earth where the umbra falls, there will be a total eclipse of the sun at that place; in the penumbra there will be a partial eclipse, and beyond the penumbra there will be no eclipse. As the earth is not always at the same distance from the moon, if an

eclipse should happen when the earth is so far from the moon that the rays of light proceeding from the upper and lower limbs of the sun cross each other before they come to the earth, a spectator situated on the earth in a direct line between the centres of the sun and moon, would see a ring of light round the dark body of the moon; such an eclipse is called *annular;* when this happens there can be no total eclipse anywhere, because the moon's umbra does not reach the earth. People situated in the penumbra will perceive a partial eclipse; and an eclipse can never be annular longer than 12 minutes 24 seconds, nor total longer than 7 minutes 58 seconds; nor can the duration of an eclipse of the sun ever exceed 2 hours.

The sun being larger than the earth, the earth's shadow is a cone, whose base is on the surface of the earth, and the moon is eclipsed by a section of the earth's shadow. If the earth were larger than, or equal to the sun, its shadow would either perpetually enlarge or be always of the same dimension; and in this case the superior planets would sometimes come within it and be eclipsed, which never happens, as the shadow does not extend to the orbit of Mars. An eclipse of the moon is *partial* when only a part of its disc is within the shadow of the earth; it is *total* when all its disc is within the shadow; and it is *central* when the centre of the earth's shadow falls upon the centre of the moon's disc. Now the nearer any part of the penumbra is to the umbra, the less light it receives from the sun; and as the moon enters the penumbra before she enters the umbra, she gradually loses her light, and appears less brilliant. The duration of an eclipse of the moon, from her first touching the earth's penumbra to her leaving it, does not exceed five hours and a half. The moon does not continue in the earth's umbra longer than three hours and three-quarters in any eclipse, neither is she totally eclipsed for a longer period than one hour and three-quarters. As the moon is actually deprived of her light during an eclipse, every inhabitant upon the face of the earth who sees the moon sees the eclipse. An eclipse of the sun, as we have said, happens when the moon, passing between the sun and the earth, intercepts the sun's light; and the sun can only be eclipsed at the new moon, or when the moon, at its conjunction, is in or near one of its nodes. For unless the moon is in or near one of its nodes, it cannot appear in or near the same plane with the sun; without which it cannot appear to us to pass over the disc of the sun. At every other part of its orbit it will have so much northern or southern latitude as to appear above or below the sun. If the moon be *in* one of its nodes, having no latitude, it will cover the whole disc of the sun, and produce a total eclipse, except when its apparent diameter is less than that of the sun: if it be *near* one of its nodes, having a small degree of latitude, it will only pass over a part of the sun's disc, or produce a partial eclipse. In a total eclipse of the sun the shadow or umbra of the moon falls upon that part of the earth where the eclipse is seen, and a spectator placed in the shadow will not see any part of the sun, because the moon will intercept all the rays of light coming directly from the sun. In a partial eclipse of the sun a penumbra, or imperfect shadow of the moon, falls upon that part of the earth where the partial eclipse is seen. Were the orbit of the earth and that of the moon both in the same plane, there would be an eclipse of the sun every new moon, and an eclipse of the moon every full moon. But the orbit of the moon makes an angle of 5¼° with the plane of the earth's orbit, and crosses it in two points, called the *nodes.* Astronomers have calculated that if the moon be less than 17′ 21′ from either node at the time of new moon, the sun may be eclipsed; or if less than 11° 34′ from either node, at the full moon, the moon may be eclipsed; at all other times there can be no eclipse, for the shadow of the moon will fall either above or below the earth at the time of new moon; and the shadow of the earth will fall either above or below the moon at the time of full moon. An eclipse of the sun begins on the western side of his disc and ends on the eastern; and an eclipse of the moon begins on the eastern side of her disc and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon. See ASTRONOMY.

ECLIPTIC, the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from west to east. The Greeks observed that eclipses of the sun and moon took place near this circle; whence they called it the *ecliptic.* By a little attention we shall see that the sun does not always rise to the same height in the meridian, but seems to revolve round the earth in a spiral. (See DAY.) We likewise observe every day, at its rising and setting, new stars in the neighbourhood of the sun. It will also be seen that the sun is in the equator twice a year, about March 22 and September 22. The points of the equator at which the sun is stationary on these days are at the intersection of the equator with the ecliptic. June 21 the sun reaches its greatest height in the heavens, and December 21 it descends the lowest. Because the sun appears to turn back at these points they are called the *tropics,* and the times at which the turning appears to commence are called *solstices* (*solstitia, solis stationes*). At these points the sun has attained its greatest distance from the equator. These four points, the equinoctial and solstitial points, are distant from one another a quarter of a circle, or 90°. Each of these quadrants, or quarters of a circle, is divided into three equal arcs of 30°; thus the whole ecliptic is divided into twelve equal arcs or signs: these receive their names from certain constellations through which the ecliptic passes, and which extend each 30°. The constellations, or twelve celestial signs, succeed one another in the following order, from the vernal equinox, reckoned towards the east:—

♈ Aries, March 20.	♎ Libra, September 23.
♉ Taurus, April 20.	♏ Scorpio, October 23.
♊ Gemini, May 21.	♐ Sagittarius, Nov. 22.
♋ Cancer, June 21.	♑ Capricornus, Dec. 21.
♌ Leo, July 22.	♒ Aquarius, January 19.
♍ Virgo, August 23.	♓ Pisces, February 18.

The days of the month annexed show when the sun, in its annual revolution, enters each of the signs of the zodiac. The 30° in every sign are divided into minutes and seconds, not reckoned separately, but after the signs. An arc of the ecliptic, for example, of 97° 15′ 27″, reckoned from Aries eastward, is called three signs, 7° 15′ 27″ lon., or, what is the same thing, it terminates in 7° 15′ 27″ of Cancer. In this way the longitude of the stars is given. The ecliptic, like all circles, has two poles, which move about the poles of the earth every twenty-four hours, and in this manner describe the polar circles. What appears to be the path of the sun, however, is in reality the path of the earth. The planets and the moon revolve in different planes; but these are inclined at only a very small angle to the plane of the ecliptic; hence these bodies can be but a small distance from the ecliptic. The plane of the ecliptic is very important in theoretical astronomy, because the

courses of all the other planets are projected upon it and reckoned by it. By the obliquity of the ecliptic we understand its inclination to the equator, or the angles formed by the planes of these two great circles. This angle is measured by the arc of a third great circle, drawn so as to intersect the two others perpendicularly, in the points at which they are farthest apart. These points of intersection are 90° distant from those points at which the equator and ecliptic intersect each other, that is, the solstitial points. The ancients endeavoured to measure the obliquity of the ecliptic. According to Pliny, it was first determined by Anaximander; according to Gassendi, it had been ascertained by Thales. The most celebrated measurement of this obliquity in ancient times was made by Pytheas, at Marseilles. He found it, 350 B.C., to be 23° 49′ 23″. A hundred years later, according to Ptolemy, Eratosthenes found it to be 23° 51′ 20″. Various measurements have subsequently taken place, even down to our own time; and it is remarkable that almost every measurement makes the angle less than those which preceded it. Among the modern estimates are that of Cassini, 23° 28′ 35″; of Lacaille, 23° 38′ 19″; of Bradley, 23° 28′ 18″; and of Mayer, 23° 28′ 16″: the observations of Delambre, Maskelyne, Piazzi, Bessel, and others, give this important astronomical element, for the year 1800, at 23° 27′ 56″. In respect to the decrease of the inclination of the ecliptic, the most celebrated astronomers of our time, as Lalande, adopted the opinion that this decrease continues uninterruptedly. Louville determined the annual decrease to be 1′, La Caille 44″, and Lalande 33″. Several philosophers of modern times concluded, from these observations, that the equator and the ecliptic were formerly in the same plane, that the shock of a comet, or some mighty revolution on the earth, gave the axis of our planet this inclination, and that for thousands of years the axis has been returning to its original position, which it will reach after 190,000 years. Laplace, on the contrary, in his Mécanique Céleste, showed that this will never take place, but that the decrease of the angle between the planes of the equator and the ecliptic depends merely upon a periodical effect, arising from the action of the other planets; that, after a certain time, it will increase again, and that the limits of variation are narrow and fixed. A very long space of time will be required to make satisfactory observations respecting this fact. The inclination of the ecliptic, or, which is the same thing, the inclination of the axis of the earth towards the ecliptic, is subject to another change, which makes it increase and decrease alternately for nine years, during which time the greatest difference amounts to 18′: of this more is said under the article NUTATION OF THE EARTH'S AXIS.

ECLOGUE, in poetry, a select piece of any sort; in general, select poems, or several poems of the same form; thus the satires of Horace were called *eclogues*. Since Virgil's Bucolics received this name (from grammarians probably, and not from the poet), the term *eclogues* has usually been applied to what Theocritus called *idyls*—short, highly-finished poems, principally of a pastoral nature. See IDYL.

ÉCOLE DES BEAUX ARTS (*Fine Art School*). The government school of the fine arts at Paris was founded by Mazarin in 1648, and was originally located in the Collége de France. It was afterwards transferred to several other seats in succession, and has since 1816 been established in the old convent of the Petits-Augustins. By a decree issued Nov. 13, 1863, very considerable alterations were made in the management and constitution of this school. The management, which had previously been in the hands of the Academy, was transferred to the government, and the teachers, who had formerly been divided between two departments, one comprising painting and sculpture, and the other devoted to architecture, were now classed as *professeurs chargés de cours*, or those engaged to teach the regular branches in the course of instruction, and *chefs d'atelier*, or superintendents of the work-room. There are seven of the former and eleven of the latter. The competitions for the *grands prix de Rome* take place at this school. All artists between the ages of fifteen and twenty-five, whether pupils of this school or not, are open to compete, after passing two preliminary examinations. The competitions in painting, sculpture, and architecture are annual, those in engraving on copper are held every two years, and those in engraving on medals and precious stones every three years. A single prize is awarded in each branch. The successful competitors in the first four branches receive an annual allowance from the state for four years, and those in the last branch for three years. In every case two of the years for which the allowance is made must be passed at Rome.

ÉCOLE NORMALE SUPÉRIEURE, a school at Paris for the training of those teachers who have the charge of the secondary education in France. It was created by a decree of the convention dated the 9th of Brumaire of the year III. (Oct. 30, 1794). During the first session, which lasted from Jan. 19 to May 18, 1795, there were 1500 pupils, all young men above twenty-one years of age, who had already received a good education, and who had been chosen by the departmental administrations. They were to receive 1200 livres (£48) for the period of their stay at the school. Among the teachers in this school were some of the most distinguished scholars and men of science that France could boast at the time, such as Lagrange, Laplace, Haüy, Daubenton, Berthollet, La Harpe, &c. The lectures were delivered in the Muséum d'Histoire naturelle. In 1800 they were published in a collected form in two vols. On finishing their course the pupils left Paris charged with the duty of establishing similar schools for the education of teachers in their own districts. Napoleon I., by the decree of 1808, and the regulations of March 30 and May 29, 1810, organized a new École normale, for the reception of pupils of the lycées of above seventeen years of age, who were to be educated free of cost for the teaching profession. The curriculum extended over two years, during or at the termination of which they were expected to take a degree either in the department of literature or of science. The restoration caused few alterations to be made in the École normale; the chief change then made was the increase of the length of the curriculum to three years. At a later period, however, the school was suspected of fostering sentiments hostile to the government, in consequence of which it was suppressed in 1822, and an attempt made to supply its place by an *École préparatoire*. A decree of the date Aug. 6, 1830, re-established the École normale, on which occasion V. Cousin revised the course of study pursued at the school, and introduced considerable changes. The chief change was the institution of annual competitions among the pupils, the best of whom belonging to each year were admitted free of charge, while the others were required to pay 500f. (£20) towards defraying the cost of their education. In 1846 the school hitherto called merely École normale had its name changed to École normale supérieure. The revolution of 1848 again opened the school to all pupils free of charge.

ÉCOLE POLYTECHNIQUE, a school in Paris established with the purpose of giving instruction in matters connected with the various branches of the public service, such as mines, roads and bridges, en-

gineering, the army and the navy, government manufactures, &c. It was founded under the name of the École centrale des Travaux publics, by a law of the convention dated 7th Vendémiaire of the year III. (Sept. 28, 1794), and accordingly exactly one month before the École normale supérieure, on the suggestion of Lamblardie, director of the École des Ponts et Chausées, and with the aid of Monge, Carnot, and Prieur. It was originally intended to furnish instruction only in civil and military engineering. The pupils were required to be of French nationality, and between sixteen and twenty years of age. At a later time the maximum limit of the age at which pupils were admitted was extended to twenty-five for those in the military department. The length of the curriculum was three years. Among the original professors were Lagrange, Prony, Monge, Hachette, Delorme, Baltard, Fourcroy, Vauquelin, Berthollet, &c. The school gave admission originally to 400 pupils. A law of Sept. 1, 1795, gave it its present name; and another of the 22d Oct. of the same year defined the relations between it and the special schools for the separate branches taught in the former, reduced the number of pupils to 300, and made the length of their course greater or smaller according to the profession adopted by the pupil. The curriculum for all was afterwards limited to two years, which is its present duration. At first the pupils were not required to live within the school buildings, but in 1805 a radical change was made in the organization of the school. The pupils were required to live in the school buildings, and were organized as a military corps. They were also obliged to provide themselves with books, instruments, and everything else they should want, and to pay yearly 800f. (£32) to the state. This sum was afterwards raised to 1000f. (£40). The school was originally placed under the direction of the minister of the interior, but it afterwards passed under that of the minister of war. New regulations relating to this school were issued on the 1st and the 25th of Nov. 1852, but these in the main confirmed those previously existing. The pupils who, on quitting the school, pass satisfactory examinations are admitted into the public service. A list of the situations open to them is made out, and each pupil in order of merit has the right of sending a notice to the administration, stating in their order those branches of the service for which he has most inclination.

ECTHLIPSIS, in Latin prosody, the elision of an *m* at the end of a word with the preceding vowel, before another word beginning with a vowel or the letter *h*.

ECUADOR, an independent republican state in South America, lying under the equator, whence it takes its name. It lies between about 5° 20′ S., and 1° 40′ N. lat., and 70° and 81° 40′ W. lon. Its greatest length from Cape San Lorenzo on the W. to the lon. 70° W. is 760 miles, and the area of the state is about 220,000 square miles. The Galapagos Islands belong to Ecuador, and these add about 3000 square miles to the area. Ecuador is divided into three districts, which are respectively named after their capitals, Quito, Guayaquil, and Cuenza. This state embraces every variety of climate, having *tierras calientes*, or low tracts, insufferably hot; *templadas* or temperate regions, from 6000 to 9000 feet above the sea; *frias*, or cold districts, extending from the upper limits of the preceding to the borders of the *paramos* or cold deserts, lying between the elevation of 11,000 feet and the limits of perpetual snow; and finally, the *nevados* or snowy heights themselves. The culminating summits in this part of the Andes are ranged close together in double file, or along the outer edges of a narrow elevated longitudinal ridge, in the hollows of which is collected the chief population of the state. On the west of this ridge the declivities of the Cordilleras are covered with dense forests. On the east also impenetrable forests occupy the mid region, between the temperate heights and those interminable and periodically desert plains below, here called by the Spanish name Llanos, and which resemble the pampas and savannas of other regions. The central ridge or elevated region of Ecuador is formed by a double range of snow-clad mountains—several of them active volcanoes—which inclose a longitudinal valley, varying in elevation from 8800 to 13,900 feet, and divided by transverse barriers. The most elevated of these mountains are on the western range, Chimborazo, Iliniza, Casalagua, Cotacachi, Pichincha, Corazon, Atacasho; on the eastern range, Cayambi, Antisana, Cotopaxi, Llanganate, Altar, Sincholagua, and Sangai. The average height of the mountains on the western range is lower than on the eastern, but the highest mountain of all is Chimborazo (21,440 feet) on the western range. On the plain of Quito, 9300 feet above the sea, there reigns a perpetual spring, with a temperature so constant that even the snow line on the surrounding mountains seems hardly to vary throughout the year. The absolute height of the line of perpetual congelation is here about 15,700 feet, which is considerably lower than in Bolivia, where, owing to the dryness of the climate, the fall of snow is scanty. At Quito the rain is abundant, falling generally for a few hours in the afternoon, and rarely so constant or so heavy as to mar seriously the enjoyment derived from the usually bright sky and delicious atmosphere. Further south, in Loja, and east in the plains, there is less rain than at Quito; while on the opposite direction, at Barbacoas, it rains nearly every day in the year. The country round Guayaquil is inundated to a great extent in the rainy season (July), after which it remains for some months a pestilential marsh, from which issue incredible multitudes of mosquitoes and other noxious insects, and reptiles. Cotopaxi, though not the highest, is the most celebrated and conspicuous peak in this most remarkable region of the Andes. It attracts the eye at once, being a perfectly symmetrical truncated cone, presenting a uniform, unfurrowed field of snow of resplendent brightness. It is not to its beauty, however, that it owes its celebrity, but to its terrific eruptions, which, recurring frequently in the course of the last and the beginning of the present century, totally changed the face of the south part of the valley of Hambato, overturned the towns or buried them under scoriæ and ashes. Riobamba was destroyed in 1797 by an eruption of Tunguragua, when the rivers, dammed up by masses of rock falling from the mountains, swept away every vestige of the town. Great numbers of the inhabitants perished on that occasion. Pichincha, which, previous to the Spanish conquest, was an active volcano, rises immediately above the plain of Quito. Its crater is 3 miles in circumference, and may be viewed by a spectator from the precipitous rocks which form its brim. Thus seen it appears to be nearly on a level with the plain of Quito, or about 6600 feet, or 1¼ mile deep, and is quite black within, while its upper edges are covered with snow.

The cultivated land and the population of Ecuador lie chiefly in the valley, which extends along between the summits of the Cordillera, and which may be considered as divided by transverse ridges or dykes into the valleys of Quito, Hambato, and Cuenza. The average height of this tract is about 9000 feet above the sea, though at its south extremity, at and beyond Loja, it sinks about 2000 feet. The chief rivers are the Marañon or Amazon, and the Caqueta or Japura, the Putumayo or Ico, the Aguarico, the Napo, the

Curaray, the Pastaca, and the Marana, the waters of which all find their way either directly or indirectly to the Marañon. They are for the most part rapid torrents, quite unavailable for purposes of internal communication. Some of the streams on the coast may perhaps be plied for a few miles by the canoes of the Indians, but commerce derives no aid from their navigation. On the west or maritime side of the mountains the chief rivers are the Patia, noted only for the extreme insalubrity of its valley; the Mira, the Esmeraldas, so called from the ancient emerald mines (now deserted) on its banks, and the river of Guayaquil, formed by the junction of two small streams, the Caracol and Daule. The estuary at the mouth of this river, being protected towards the sea by the large island of Puna, forms a secure and capacious harbour, sometimes called the Gulf of Puna. This island is remarkable as being the landing-place of Pizarro, when he led his adventurous band to the conquest of Peru.

Ecuador is comparatively poor in Mammalia; although various kinds of deer as well as tapirs and peccaries are found in the forests. Parrots and humming-birds are also numerous, but perhaps the most remarkable of the birds in Ecuador is the condor, which dwells on the slopes of the Andes. On the sea-coast life is rendered miserable by the incessant stings of flies and insects. Reptiles are abundant in the forests, and alligators in the streams. The botanical productions of this country are many and intrinsically valuable, but not absolutely peculiar to it, and they are consequently excluded in some degree from commerce by the competition of countries (such as New Granada and Venezuela) which are nearer to the European markets, and have greater facilities of internal communication. The cinchona bark of Loja is of the best kind, and was formerly in general demand; but the price now paid for it barely defrays the expense of carrying to the sea-coast. The cocoa of the same locality and of the coast near Guayaquil is excellent, and finds a ready sale in Mexico. Rice, pepper, tobacco, and wheat are among the other products. Agriculture is in a very backward state.

Of the population of Ecuador, the aboriginal red race or Peruvians, as they may be called, speaking the Quichua or some cognate language, form more than half; the rest are negroes, mulattoes, mestizoes, zamboes, a degenerate breed of mixed negro and Indian blood, and whites, the last a small minority. The whites or Spanish creoles are the chief possessors of the land; the civilized Indians form the great body of the labouring classes, and produce almost all the articles that are exported from Ecuador. The commerce of Equador is unimportant, the only port suitable for foreign trade is Guayaquil. In 1870 the total number of ships that entered this port was 125 of 55,310 tons burden, and sixty-six of these were steamers belonging to the Pacific Steam Navigation Company. The most important article of commerce is cocoa, which partly grows wild, but is also cultivated in the hot maritime districts. This article was exported from Guayaquil in 1871 to the value of £426,800, chiefly to Spain. The other chief exports of Ecuador are gum, straw hats, Peruvian bark, archil, and cascarilla. The total exports from Ecuador in the year mentioned were valued at £761,421, and the total exports to Britain at £277,766. The total imports from Britain amounted to £61,167. Mining and manufactures are unimportant. The latter are confined almost exclusively to weaving for home consumption, and to the plaiting of the so-called Panamá hats and other articles made of the same material. The intellectual status of the inhabitants is very low. Very little is done for the education of the people. The schools are under the influence of an uncultivated clergy, and almost all the independent Indian population have sunk back to a state of heathenism. The religion is Roman Catholic. There is one archbishopric, Quito, and six bishoprics, Loja, Ibarra, Riobamba, Cuenza, Guayaquil, and Manabi. Slavery was abolished in 1854.

The territory belonging to the present Republic of Ecuador, at the time of the conquest of Peru by the Spaniards formed part of the great empire of the Incas. After this period the civilization of the inhabitants very rapidly declined, and the towns and admirable roads, which, laid out on a uniform plan, led over the passes of the Andes, sometimes to a height exceeding that of Mont Blanc, fell into decay; but the remains of these royal roads or causeways, as well as of the Tambos or palaces, still attest the perseverance, grandeur of design, and careful workmanship of the natives. From 1532 till 1822 Ecuador was under Spanish government, and formed first a part of the viceroyalty of Peru, then, from 1564 till 1718, an independent presidency, and from the latter date part of the presidency of New Granada. When New Granada declared its independence in 1811, Ecuador took part in the revolutionary war against Spain which followed, and its own independence as a part of the central Republic of Colombia was secured in 1822. After much internal strife and bloodshed Ecuador erected itself in Nov. 1831 into a separate republic under General Juan José de Flores. The subsequent history of Ecuador forms an uninterrupted series of revolutions and wars with neighbouring states, especially with Peru. Many alterations were made in the constitution of Ecuador in consequence of the revolution which broke out in Quito in 1869. The basis of the present constitution dates from 1845, although it has been modified on several occasions besides the one just mentioned. The government is vested in a president elected for a term of four years by an elective assembly consisting of 900 electors, 300 for each state. He is assisted by a vice-president, who acts as minister of the interior and for foreign affairs; a minister of war and of marine and a minister of finance; besides a council, of which, in addition to the ministers of state, the president of the supreme law-courts and a bishop are members.

The congress is the legislative body, and consists of two houses, one formed of eighteen senators, the other of thirty deputies, both elected by universal suffrage. The congress has extensive privileges, and cannot be dissolved by the president. The seat of government is at Quito. In 1870 the revenue was £362,774, and the expenditure £277,932. The army consists of about 1500 men, and the navy of two small steamers and a pilot boat.

ECZEMA, a disease of the skin, marked by an eruption of small vesicles, preceded by redness, heat, and itching of the part. In course of time the minute vesicles burst, and discharge a thin acrid fluid, which often gives rise to excoriation. The most severe form of this disease arises from the effects of mercury on the system, but the disease is likewise caused by exposure of the skin to irritating substances. It frequently occurs on the hands of grocers from working amongst raw sugars, and is then named 'grocer's itch.' It also occurs amongst bricklayers, masons, and others, from the effect of the lime on the skin. The best treatment is frequently bathing the parts affected in tepid water, and the application of emollient poultices.

EDAM, a town of North Holland, near the Zuyder-Zee, 12 miles N.N.E. of Amsterdam, and about a mile from the western shore of the Zuyder-Zee, with which it is connected by a canal. Population 5267. This place is chiefly noted for its trade in cheese, of which nearly 1,000,000 lbs. are annually

sold in its market. The Edam is all sweet-milk cheese, which is divided, according to its rind, into red and white. The town was once fortified, and has still walls with seven gates.

EDDA, two collections of ancient Icelandic poems, which, as they came from the Norwegians (Norsemen), who emigrated to Iceland, are of German origin. They are the chief source of the mythology of the gods and heroes of the north of Europe. The first of these collections, called the Older or Sæmundic Edda, is said to have been prepared by Sæmund Sigfusson, a learned Icelandic clergyman, who lived from about 1056 to 1133, and studied at Paris. In 1643 the best copy extant of this older collection was found and rescued from decay by Bishop Brynjulf Svendson. It consists of thirty-nine songs, written in alliterative verse, and is divided into three parts, the first of which contains tales of the Scandinavian gods and goddesses, making a tolerably complete mythology of the Ases (see NORTHERN MYTHOLOGY), and particularly narratives of the exploits and adventures of the three chief Scandinavian deities, Odin, Thor, and Freya; the second contains the songs relating to the Scandinavian heroes, and especially celebrates the achievements and fortunes of Sigurd and his ancestors; and the third, the most valuable, is the dogmatic portion of the work, containing the elements of the religious faith of the ancient Scandinavians, from the creation to the destruction of the gods. In the song of Sigurd in the second part can be traced the origin of the legend of the Nibelungen. According to the results of the latest German criticism on this subject the majority of these poems are assigned to a period earlier than the ninth century, and seem gradually to have arisen at different dates, from the sixth century downwards. The prose Edda, or Younger Edda, which contains a great deal of information about the Scandinavian mythology, with dissertations on the language and metres of the Icelandic poets, and numerous extracts, was based on these poems, then complete, and other ancient songs. Its date is perhaps 120 years later, and it is usually ascribed to Snorro Sturluson, lagmann of Iceland, and sewer of King Haco, about A.D. 1200. The first part of the Older or Sæmundic Edda was printed in the original text, accompanied by a Latin translation, in 1787, by the Magnæan Institute, under the title of Edda Sæmundar Hins Froda, Pars I. (Edda of Sæmund the Wise, part i.) The second part was published in 1818, by the Magnæan Institute, containing the Volundarquida, and all the poems which form the connection between the Scandinavian and German heroic era. The third part, containing the Völuspâ, the Hâvamâl, and the Rigsmâl, was published in 1828. The best edition of the Younger Edda is that which was published with a Latin version in two volumes at Copenhagen, in 1848 and 1852, at the expense of the Arna-Magnæan Institute. The second volume of this edition contains a philological dissertation, and additions from various manuscripts. Translations of both the Eddas are numerous. An English translation of the Younger Edda by Dasent appeared in 1842; a German translation of both Eddas by Simrock in 1851; and a complete literal version of both Eddas into French was published by M. Léouzun-le-Duc in 1868.

EDDYSTONE ROCKS, well known to seamen who navigate the English Channel, consisting of three principal ridges, and extending 600 or 700 yards in length. They lie nearly in the fair way from the Start to the Lizard, and are therefore an object of the utmost importance to mariners. Hence it is, that on the summit of the largest rock a lighthouse has been erected, to serve as a beacon or signal to avoid the danger, as they are covered at the flood tide, but become dry at the ebb. The foundation of the lighthouse is one entire solid mass of stones to the height of 35 feet, dovetailed into each other, and united by every means of additional strength. It is situated 15 miles S.S.W. Plymouth, 45 E. Lizard Point; lon. 4° 16′ W.; lat. 50° 10′ 54″ N. The swell at these rocks is tremendous. After a storm, when the sea is to all appearance quite smooth, and its surface unruffled by the slightest breeze, the ground-swell or under-current, meeting the slope of the rocks, often causes the sea to rise above the lighthouse in a magnificent manner, overtopping it as with a canopy of foam. Henry Winstanley, between 1696 and 1700, built the first lighthouse, but, in 1703, perished in it, having too much confidence in the stability of his building. Another lighthouse stood from 1709 till 1755. The third was begun in 1757, by the celebrated Smeaton, and finished in 1759. It has withstood all the rage of the weather. At the line of high water the structure is 26 feet in diameter, and it rises to the height of 82 feet above that line. For 12 feet above high-water mark it consists of solid masonry. In the beginning of 1830 the upper structure had become so racked that it was deemed necessary to rebuild it.

EDEN, the original residence of the first human pair. The account given in Genesis of the situation of Eden is not such as to enable us to identify it with any existing locality. It is said to have had a garden in the eastern part of it, and we are told that a river went out of Eden to water this garden, and from thence it was parted into four heads, which were called respectively Pison, Gihon, Hiddekel, and Euphrates (Phrat). The Pison is said to compass the whole land of Havilah; the Gihon that of Ethiopia (Cush); and the Hiddekel to go toward the east of Assyria. Of the rivers mentioned the Phrat of the original seems to have been correctly identified with the Euphrates, and the name Hiddekel appears elsewhere in Scripture (Dan. x. 4) to be applied to the Tigris; but it is impossible to say what rivers or places were meant by the names Pison, Gihon, Havilah, and Cush. It was not the whole of Eden that was assigned to man for his first habitation, but the part towards the east to which the translators of the Authorized Version have given the name of the Garden of Eden, and which Milton, in Paradise Lost, calls Paradise, that word (originally Persian) having in its Greek form (*paradeisos*) been applied to the Garden of Eden by the translators of the Septuagint.

EDEN, a river in England, rising in a hill in Westmoreland, near the N.W. boundary of Yorkshire; flows N.W., crossing Westmoreland and Cumberland, passing Appleby and Carlisle, and falls into the Solway Firth. Total course, in a direct line, 40 miles.

EDENTATA, or TOOTHLESS ANIMALS, the name of an order of Mammalia, though, as a descriptive term, it is only properly applied to the ant-eaters and the pangolins or scaly ant-eaters. The remainder are merely destitute of teeth in the front of the jaws. The teeth, however, are destitute of enamel, do not have complete roots, and are not replaced by a second set. This order is also characterized by the presence of great claws surrounding the ends of the toes, and more or less approximating to the nature of hoofs. It is divided into two sections, the first comprehending the sloths, which subsist on vegetable food, and the gigantic fossil animals the Megatherium and the Megalonyx; and the second including the armadilloes and the ant-eaters, which live mainly on insects, though some of the armadillos eat other sorts of animal food, and also vegetables.

EDESSA, the name of two ancient cities.—1. The ancient capital of Macedonia, and the burial-place of its kings, now *Vodhena*. It is probably the same

with the still more ancient Aegæ. The seat of government was afterwards transferred to Pella.—2. An important city in the province of Osrhoëne, in the north of Mesopotamia, is supposed to have been founded by Seleucus, one of the successors of Alexander the Great, although some carry it back to a very ancient period, and hold that it owes its origin to Nimrod. It was governed by a race of native princes or kings, who were dependent first on the Seleucidæ, and afterwards on the Roman emperors. Subsequent to the establishment of Christianity it became celebrated for its theological schools, which were largely resorted to from all quarters. Edessa is also famous in ecclesiastical history for the pretended epistle addressed by Jesus Christ to one of its kings. In 1098, in the first Crusade, Edessa came into the hands of Baldwin, afterwards king of Jerusalem. This Edessa is thought to be the modern Orfah or Urfah.

EDFOO (ancient, *Apollinopolis Magna*), a town in Upper Egypt, on the left bank of the Nile, 54 miles S.S.E. of Thebes. It is now a poor place, composed chiefly of mean huts, but its ancient magnificence is attested by several remains, especially two temples, one of which, dedicated to Noum, is the largest in Egypt, after those of Karnak and Luxor. The sculptures on the smaller temple represent the birth and education of Horus, an Egyptian deity, whose parents were Kneph and Athor. From the masses of rubbish around and within it, it cannot be easily inspected, but its form is very regular, and its general effect grand and imposing. The modern Edfoo has a pop. of about 2000.

EDGAR (THE PEACEABLE), one of the most distinguished of the Saxon kings of England, was the son of King Edmund. He succeeded to the throne in 958, and managed the civil and military affairs of his kingdom with great vigour and success. He maintained a body of troops to control the mutinous Northumbrians, and repel the incursions of the Scots, and fitted out a powerful navy to protect his subjects from the Danes. By these precautions he not only prevented invasion from the Danes, but secured the submission of the independent provinces of Wales and Ireland, and the surrounding islands. During the reign of Edgar wolves were nearly extirpated from the southern parts of the island, by exchanging a tribute from Wales for payment in the heads of these animals. He married Elfri, daughter of the Earl of Devonshire, in 965. It was during his reign that Dunstan was primate of England. He died in 975, and was succeeded by his son Edward the Martyr.

EDGAR ATHELING, grandson of Edmund Ironside, and son of Edward the Outlaw, was born in Hungary, where his father had been conveyed in infancy, to escape the designs of Canute. After the battle of Hastings, Edgar (who had been brought to England in 1057) was proclaimed king of England by the Saxons, who still showed front against William, but was afterwards constrained to make his submission to the latter, who conferred on him the earldom of Oxford. Having been concerned in some combinations of the English nobles against William, he retreated with his two sisters, Margaret and Christina, to Scotland, where, in process of time, the former became the wife of King Malcolm Canmore. Malcolm espoused the cause of his brother-in-law, and on two different occasions led an army into England to enforce his claims to the crown, but both attempts proved failures. Edgar subsequently effected a reconciliation with William, and was allowed to take up his abode at Rouen, where a pension was assigned him. He was afterwards permitted to return to England by William Rufus, and with his sanction undertook an expedition to Scotland for the purpose of displacing the usurper Donald Bane, in favour of his nephew Edgar, son of Malcolm Canmore, and in this object he succeeded. On the accession of Henry I. he joined Duke Robert of Normandy in his ineffectual attempt to assert his rights, but was taken prisoner at the battle of Tenchebray. Henry seems to have entertained too contemptuous an opinion of him to subject him to any severe treatment, and he was accordingly allowed to spend at large in England the remainder of his days. The time of his death is unknown. He was both weak in body and feeble in intellect, and never being an object of dread or uneasiness to any of the Norman kings, was thereby throughout life secured from their violence.

EDGEHILL, an eminence in Warwickshire memorable as the place where the royal forces were drawn up on the occasion of the bloody but indecisive battle fought on Sunday, October 23, 1642, between the Royalists under Charles I. and the forces of the Parliament under the Earl of Essex.

EDGEWORTH, MARIA, a celebrated authoress, was born at Hare Hatch, near Reading, Berkshire, on January 1, 1767. In 1782 her father, Richard Lovell Edgeworth, succeeded to the family estate of Edgeworthstown, in the county of Longford, Ireland, and thither he proceeded and took up his abode. In 1802 she established her position as an authoress by her Castle Rackrent, a novel of Irish life, in which the manners and customs of a by-gone generation are most graphically and humorously described. A Treatise on Irish Bulls appeared in 1803, and about the same time commenced a series of tales of various descriptions, which were continued for many years, and are probably the structures on which her fame with posterity will rest. These comprise Moral Tales, Popular Tales, and Tales of Fashionable Life, all written in the clearest and most vigorous style, without the least affectation of sentiment or fine writing, and yet conveying unmistakably the impress of a highly educated and reflecting mind. Reference must also be made to the Parents' Assistant, that charming collection of tales for children, and the well-known series of Early Lessons, Harry and Lucy, Frank, and Rosamond. Belonging to the class of regular novels are Belinda, Leonora, Patronage, Harrington, and Ormond. Up to her father's death in 1817 all Miss Edgeworth's publications bore to be in co-operation with him, though almost all his share in their composition was restricted to a superficial revision and the pruning away of a few redundancies. In 1823 she made a journey to Scotland, and paid a visit of a fortnight to Sir Walter Scott at Abbotsford, which was subsequently returned by him at Edgeworthstown. She died on 21st May, 1849, at Edgeworthstown. The first collected edition of Miss Edgeworth's works was published in London in fourteen vols. in 1825. Other editions appeared in 1832, 1848, and 1856. A complete list of the contents of the last-mentioned edition is contained in Lowndes' Bibliographer's Manual. In estimating Miss Edgeworth's merits as an authoress, too much praise cannot be given to her terse and nervous style, alike simple and elegant, or to the lucidity and consecutiveness which characterize all her compositions. Her skill in plot is considerable, and the interest excited in the characters and issue of the story is never allowed to flag.

EDIBLE BIRDS' NESTS. See BIRDS' NEST.

EDICT, a public proclamation. In ancient Rome, the higher officers of state, who were elected annually, publicly declared, at their entrance upon office, the principles by which they should conduct their administration. This was done particularly by the ædiles, who superintended buildings and markets, and by the prætors, as supreme judges. These an-

nual proclamations, by which the deficiencies of the general statutes were supplied, and the laws were adapted to the peculiar wants of the period, gradually acquired a certain permanency, as each officer retained, unaltered, most of the regulations of his predecessor (*edictum tralatitium*); and they became, in fact, the source of that branch of Roman law, which, being founded on the official authority of the authors, was called *jus honorarium*, and was opposed to the strictly formal law, *jus civile*. Edicts were sometimes made for some special occasion, in which case they were called *edicta repentina*. It was against the abuse of this kind of edicts that the Lex Cornelia in B.C. 67 was directed. Those which were applicable in all cases during the tenure of office of the magistrate who issued them were called *edicta perpetua*. The name of *edictum perpetuum* was also given to a collection and arrangement of the clauses which the prætors were accustomed to put into their annual edicts, made under the Emperor Hadrian by Salvius Julianus about 131 A.D. What the exact nature of the work thus done by Julianus was is not known, but the edict prepared by him, and sanctioned by imperial authority, had unquestionably a special force, and it is likely that it restricted in future the right enjoyed by magistrates of issuing edicts, to such cases as were not provided for in the edict of Julianus. Only a few fragments of the ancient Roman edicts have been preserved.

EDICT OF NANTES. See NANTES.

EDINBURGH, EDINBURGHSHIRE, or MIDLOTHIAN, a maritime county of Scotland, bounded N. by the Firth of Forth, along which it extends from 11 to 12 miles; N.W. by the county of Linlithgow, N.E. Haddington, E. Berwick, and S.W. and S. by portions of Lanark, Peebles, Selkirk, and Roxburgh. Its extreme length, E. to W., is 35 miles; its breadth varies from 13 miles in the centre to about 16 on either side. Area, 234,925, of which, in 1872, 130,805 were under cultivation. The total acreage under corn crops in that year was 41,048 acres; under green crops, 22,724; under clover, sainfoin, and grasses, in rotation, 29,464; in permanent pasture, meadow, &c., 37,165. The chief corn crops are oats and barley; and the chief green crops, turnips and potatoes. The S.S.E. and S.W. parts of the county are diversified with hills, of which the two principal ranges are the Pentland and Moorfoot, the former stretching S.W. to N.E. into the centre of the county from Peebles, to within 4 miles of Edinburgh. The views from some of the higher elevations of the Pentlands, looking towards the N. and N.W., are very fine. The county is watered by several rivers, but none of any extent. The principal are the North and South Esks, and the Water of Leith. The banks of the two former are remarkable for their picturesque beauty. Edinburghshire rests on a series of strata connected with the coal formation. Coal, limestone, and sandstone are extensively wrought throughout the whole district. In the hilly parts, particularly in the south-east, the climate is cold, but healthy; in all other places it is the same with that of the adjoining coast, subject to dry and cold east winds in spring. The soil is greatly varied, but consists chiefly of a clayey loam, alternating with sand and gravel. It is not generally remarkable for natural fertility; the richest portions are the low lands towards the Forth, where the most luxuriant crops are obtained; and the valley watered by the North and South Esks, where vegetation is rapid, early, and abundant. The agricultural farms are of considerable size, varying from 100 to 400 acres; the farm buildings substantial and well arranged, generally of stone; the implements of husbandry of the best and most approved description; and the lands well drained and inclosed. A large portion of the county, however, is under pasturage, chiefly the south and hilly parts. Considerable attention is paid to the management of the dairy-farms, of which the principal produce is milk and butter for the supply of Edinburgh; most of the dairy-farms are in the western part of the county. The manufactures of the county are comparatively limited, but include ale, long celebrated; whisky, to a considerable extent; gunpowder, and paper, especially along the banks of the North Esk, which may be considered the principal seat in Scotland for the paper manufacture. The county communicates by the Union Canal with the Forth and Clyde Canal; is intersected by numerous excellent roads; and by sundry railways, all of which centre at the capital. The chief towns are: Edinburgh, capital of Scotland, Leith, Dalkeith, Musselburgh, and Portobello. The county is divided into forty-six parishes, and returns one member to the House of Commons. Pop. in 1871, 328,379.

EDINBURGH, the metropolis of Scotland, and one of the finest, as well as most ancient, cities in the empire, lies within 2 miles of the south shore of the Firth of Forth, distant from London 333 miles; from Glasgow 42 miles; and from Aberdeen 105. It is picturesquely situated, being built on three eminences which run in a direction from east to west, and surrounded on all sides except the north, where the ground slopes gently towards the Firth of Forth, by lofty hills. The central ridge, which constituted the ancient city, is terminated by the castle on the west, and Holyrood House on the east, near which rise the lofty elevations of Salisbury Crags, Arthur's Seat, and the Calton Hill. The valley to the north of this ridge consisted formerly of the North Loch, which is now drained, and traversed by the Edinburgh and Glasgow branch of the North British Railway. On the rising ground beyond this valley stands the New Town. The city altogether extends, at the present day, about 2 miles in length, and the same in breadth, and, when viewed from the Calton Hill, presents an unrivalled panoramic scene. On the right are the splendid lines of streets of the New Town, constructed of white freestone, and spreading down with moderate descent towards the sea. Opposite is displayed the vista of Princes Street, nearly a mile in length; and on the left, the huge unbroken line of tall structures forming the Old Town, terminated by the towers of the castle. Beyond and towards the south the town is seen to spread out in lines of streets and detached houses, till arrested by the inclosures towards the Braid Hills, or on the east by Arthur's Seat and Salisbury Crags. Towards the north the view from the Calton Hill is also striking, comprehending a prospect of the Firth of Forth and the hills of Fifeshire on the opposite shore.

The New Town occupies a ridge of much broader crest and less abrupt ascent than that occupied by the Old Town, from which it is separated, as already mentioned, by the hollow which was formerly the North Loch. This hollow is crossed by a stone and an iron bridge and an earthen mound. The mound was formed from the earth and rubbish obtained in digging the foundations of buildings in the New Town. The houses here, all built of a beautiful white freestone, obtained from quarries in the vicinity, are comparatively modern, and remarkably handsome; while many of the squares, crescents, circuses, &c., are magnificent. The streets, with a few exceptions, are spacious and regular, and are kept in excellent order. Extensive and well laid out pleasure-grounds, with the command of beautiful views from various points, complete the attractions of this elegant quarter of the city. On the south side of the Old Town, and separated from it also by a hollow, occupied by an ancient

street called the Cowgate, and crossed by two bridges, stands the remaining portion of the city. With the exception of a few unimportant streets, this is also comparatively a new town. The finest houses and streets in this part of the city are those in the south-most districts of Newington, Grange, Whitehouse, and Greenhill. The city has of late years grown rapidly in this direction, till it is now connected with the suburb of Morningside, by way of Greenhill. The principal street in the Old Town is that which occupies the crest of the ridge on which the latter is built, and which bears, at different points, the names of Canongate, Netherbow, High Street, Lawn Market, and Castle Hill. This ancient and very remarkable street—for, notwithstanding its various names, it is but one street, being continuous and uninterrupted from one end to the other—is upwards of 1 mile in length, rising gradually with a regular and steep incline from a small plain at the east end of the town, on which stands the palace of Holyrood, and terminating in the huge rock on which the castle is built, 383 feet above sea level. The appearance of this street, the scene of many interesting historical incidents, is rendered exceedingly imposing by the loftiness and antique aspect of the houses with which it is lined, many of them ranging from five to seven stories in front, and several more behind. On the right-hand side, going east, the High Street opens into Parliament Square, where stand St. Giles's Church and the ancient Parliament House. In front of St. Giles's Church stands the ancient cross, restored in 1866. Lower down also on the right side is the Tron Church. Further on is the site of the Netherbow Port, one of the ancient gates of the city, and near it on the left side the house in which John Knox lived. The main street, now taking the name of Canongate, extends to Holyrood House. From the High Street descend laterally in regular rows numerous narrow lanes called closes, many of them extremely steep, and very few, at their entrances, more than 6 feet wide; those which are broader, and admit of the passage of carriages, are called wynds. In these and the adjacent streets the houses are frequently more than 120 feet in height, and divided into from six to ten stories, or as they are locally termed flats, the communication between which is preserved by broad stone staircases, winding from the lowest part of the building to the top; and each floor or flat is inhabited by two families, the entrance to all the different dwellings being from the common staircase. The streets in the New Town most worthy of notice are Princes Street, George Street, and Queen Street, all lying parallel to each other, east and west. Princes Street runs along the edge of the hollow which separates the New Town from the Old. Being built only on the north side, a magnificent view of the Old Town, towering high and darkly on its rocky ridge, of the lordly castle, and the intervening valley, is obtained, rendering it one of the most delightful promenades of which any city can boast. At the east extremity of this street is the Calton Hill, one of the most striking features of this singular city, being a rocky eminence, studded with monuments, with a broad verdant summit, commanding a view of the Firth of Forth, with its shipping and surrounding shores, of surpassing beauty. Beyond the east extremity of the town a huge belt of precipitous rock, called Salisbury Crags, rises to the height of nearly 500 feet from the deep valley below. Immediately behind, a conical hill, with a narrow, rocky summit, called Arthur's Seat, towers above the Crags, obtaining an elevation of 822 feet. A broad pathway winds along the face of the Crags; and a carriage-drive leads round the entire hill, from many points of both of which beautiful prospects are obtained.

In the Old Town the most remakable, and, next to Holyrood, the most interesting public building, is the castle, the position of which has been already described. The fortress contains accommodation for 2000 soldiers, and the armoury space for 30,000 stand of arms. On a small flagged area, occupying the highest summit of the castle, and called the bomb battery, stands conspicuously a huge piece of ancient ordnance, called *Mons Meg*, built of malleable iron staves, cask fashion, and believed to have been forged at Mons, in Flanders, A.D. 1486, though Sir Walter Scott and other archæologists suppose it to have been made at Castle-Douglas. In an apartment in the castle is kept the ancient regalia of Scotland, found in the year 1818 in an old oaken chest, where they had lain undiscovered for upwards of a century. They consist of a crown, sceptre, and sword of state. At the east end of the lofty range of ancient buildings on the south-east side of the castle a small room is pointed out in which Queen Mary gave birth to James VI., on June 19, 1566. Since June 7, 1861, one of the guns on the castle has been fired every day (except Sunday) precisely at one o'clock, to enable the inhabitants of the city to know the correct time. The gun is fired by clock-work in connection with a clock on the castle, which is in electric communication with the observatory on the Calton Hill. The Palace of Holyrood, or Holyrood House, as it is more generally called, stands, as already mentioned, at the lower or east extremity of the street leading to the castle. No part of the present palace is older than the time of James V. (1528), while the greater portion of it dates only from the time of Charles II. In the north-west angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. On the area in front stands a handsome stone fountain, elaborately sculptured, designed on the model of the old fountain which stood in the court of Linlithgow palace. Adjoining the palace on the north side are the ruins of the chapel belonging to the Abbey of Holyrood, founded in 1128 by David I., the only portion of that establishment now remaining. A privilege of sanctuary for insolvent debtors is attached to this abbey, and extends over Arthur's Seat, Salisbury Crags, and for a considerable distance east, including altogether a space of about 5 miles in circumference.

The Cathedral of St. Giles, the tutelar saint of the city, situated in the High Street, is a large ancient edifice in later Gothic style, of no great beauty, but having, on the whole, rather an imposing appearance. The exterior was entirely renovated, with questionable taste, in the years 1829–32. Internally the eastern portion of it was restored between 1872 and 1873.

The Parliament House, now forming the vestibule of the Court of Session, is the place in which the Scottish Parliament met before the Union. It is a magnificent hall, 122 feet long by 49 feet broad, with a lofty open timber roof, and contains marble statues of Duncan Forbes of Culloden, the first Lord Melville, Lord Chief-baron Dundas, Lord President Blair, Lord Jeffrey, and Lord Cockburn. Adjoining the Parliament House, with which it has a communication, is the Advocates' Library, containing the largest and most valuable collection of books in Scotland, the printed works amounting to 150,000 volumes, and the MSS. to 1700. In an adjoining building is the Signet Library, belonging to the writers to Her Majesty's Signet, containing about 50,000 volumes. Among the other buildings of note in Edinburgh are the Royal Institution, a beautiful Grecian edifice, erected for the accommodation of the Royal Society of Edinburgh, and other bodies, and containing the

Antiquarian Museum, the Gallery of Ancient Statuary, and the life school of the Royal Scottish Academy; the National Gallery, built in the Ionic style, and situated behind the Royal Institution; the Physicians' Hall, in Queen Street; the assembly-rooms and music-hall, in George Street; the register office, with an equestrian statue of the Duke of Wellington in front; the general post-office; the Museum of Science and Art (the foundation-stone of which last two buildings was laid on the 21st Oct. 1861); the Theatre-royal; the university buildings; the Tron Church, a very ordinary-looking structure, founded in 1637; the sheriff court buildings; the Royal Exchange; the new Corn Exchange in the Grassmarket; the Bank of Scotland; and the New or Free Church College at the head of the Mound, an elegant structure in the Tudor style; the jail and bridewell; the high-school, a splendid Doric edifice, about 270 feet in length; the Royal Astronomical Observatory on the Calton Hill, &c. &c.

The most remarkable and by far the most elegant of the public monuments of Edinburgh is that to Sir Walter Scott, on the south side of Princes Street. Its form is that of an elaborate Gothic cross, 200 feet high, being a composition from Melrose Abbey, designed by George M. Kemp, a self-taught genius. A marble sitting figure, by Steele, of the novelist and poet, occupies the platform of the monument, and over it the groined arches form a canopy. The other noteworthy monuments in the city are those to the poet Burns, Hume the historian, Allan Ramsay, James Watt, and Lord Melville; with bronze statues of the Earl of Hopetoun, Professor Wilson, George IV., and William Pitt (the last two by Chantrey); on the esplanade in front of the castle those to the Duke of York, and the officers and men belonging to the 78th Highlanders who fell in the Indian mutiny in 1857–58; and on the Calton Hill those to Lord Nelson, Dugald Stewart, and Playfair the mathematician.

Few cities of equal extent are possessed of more numerous and more magnificent hospitals and charitable institutions. Among these Heriot's Hospital, on the south side of the city, founded by George Heriot, goldsmith and jeweller to James VI., is a fine old Elizabethan structure, designed by Inigo Jones, and one of his finest works. The object of the institution is the maintenance and education of poor boys, the sons of freemen of the town of Edinburgh; and the surplus funds are employed in establishing and maintaining free schools in various parts of the city. Of the numerous other hospitals and benevolent institutions, many of which have handsome and extensive buildings, the following may be specified:—Donaldson's Hospital, George Watson's Hospital, John Watson's Hospital, Gillespie's, Stewart's, Cauvin's, the Orphan, the Merchant Maidens', &c. Some of these are now converted into day-schools.

Edinburgh is the seat of the supreme courts of Scotland.

The more prominent educational institutions of Edinburgh are the university; the New or Free Church College, for the education of theological students of the Free Church; the U.P. Divinity Hall, for the education of those belonging to the United Presbyterian Church; the High-school, the Edinburgh Academy, the Training Colleges for teachers of the Established, Free, and Episcopal Churches; and the Royal Scottish Academy of Painting, Sculpture, and Architecture. There are also several public seminaries, and a number of schools for the education of the poorer classes; Heriot schools, thirteen in number, elsewhere spoken of; the School of Arts, established in 1821, for the instruction of mechanics and tradesmen in the elements of scientific knowledge. The societies and institutions for the promotion of science and other branches of knowledge are exceedingly numerous. The principal are the Royal College of Physicians, incorporated in 1681; the Royal College of Surgeons; the Veterinary College; the Royal Society; the Highland Society, instituted in 1785, for the promotion of agricultural improvements in Scotland; the Astronomical Society; the Society of Antiquaries, established by royal charter in 1780; the Medico-Chirurgical Society; the Royal Medical Society; the Wernerian, the Botanical, and the Speculative Society. There are several public libraries in the city, besides the Advocates', Writers to the Signet, and College Libraries; and two public gardens connected with scientific objects—the Caledonian Horticultural Society's Garden, and the Royal Botanic Garden, both in Inverleith Row.

Manufactures and Trade.—The manufactures of Edinburgh are neither extensive nor important; ale-brewing, for which it has been famous for upwards of 200 years, is the principal. There are now about thirty breweries in the city. Shawl-making, coach-building, type and iron founding, the manufacture of india-rubber and vulcanite, and letter-press printing are carried on to a considerable extent; and also the making of various kinds of machinery, generally of the smaller class. Glass painting and staining are also prosecuted to some extent, and with much success. Edinburgh is the head-quarters of the book-trade in Scotland; and as a literary mart it is the second town in the United Kingdom, being in this respect excelled only by London. In the present century it has even led the way in the introduction of literary ventures of a new class. Here was started the Edinburgh Review, the first of the quarterlies; Blackwood's Magazine, which, by its life and vigour, revolutionized the character of the monthlies; and Chambers' Edinburgh Journal, the first of the cheap weeklies.

The origin of the city of Edinburgh and the derivation of the name are alike uncertain. The town is mentioned as early as the tenth century, but it did not acquire much importance until it was made the royal residence and capital of Scotland under the Stuarts in 1437. The first Parliament held at Edinburgh was in 1215, and after 1456 nearly all the Scottish Parliaments were held there. In 1296 the castle was taken by Edward I.; in 1313 it was recaptured by Randolph, earl of Moray. In 1650 the city and castle surrendered to Cromwell, and in 1689 to the troops of William III. In 1745 it opened its gates to the Pretender, Prince Charles Edward. In 1736 it was the scene of the famous riots of the Porteous mob, of which a graphic account is given in Sir Walter Scott's Heart of Midlothian. Edinburgh is the native city of John Law, the projector of the Mississippi scheme; David Hume, the philosopher and historian; Hugh Blair, the theologian and writer on belles-lettres; Dugald Stewart, Sir Walter Scott, and Lord Brougham.

Edinburgh is a terminus of the Caledonian and North British Railways. Leith (which see) is its port, and may be said to form a suburb of it. It returns two members to Parliament. Pop. of parl. bor. in 1861, 168,121; in 1871, 196,979.

EDINBURGH, UNIVERSITY OF. This university was founded in 1582 by a charter granted by James VI. of Scotland. In 1621 an act of the Scottish Parliament ratified to the university all the privileges and immunities enjoyed by other universities in the kingdom, and the ratification was confirmed in the Treaty of Union between Scotland and England, and in the Act of Security. The constitution of the university was modified by the act of 1858 relating to the Scottish universities, by which the university

court and the body of curators were created, and various regulations were made providing for the better government and discipline of the university. The university is a corporation consisting of a chancellor, rector, principal, professors, registered graduates and alumni, and matriculated students. It is governed by the university court, the Senatus Academicus, and the general council. The chancellor of the university is elected for life by the general council. He is the head of the university and the president of the general council. It is through him that degrees are conferred, but in performing this function he may be represented by a vice-chancellor, who is nominated by the chancellor. The rector is elected for a term of three years by the whole body of matriculated students. He presides over the university court. The principal is the resident head of the college and president of the Senatus Academicus. The office is held for life. The university court consists of the rector, principal, the lord-provost of Edinburgh, and assessors appointed by the chancellor, town-council of Edinburgh, the rector, the general council, and the senatus respectively. The university court has power to review all decisions of the Senatus Academicus, except as otherwise expressly regulated; to improve the arrangements of the university, after due communication with the senatus, and after such proposed improvements have been submitted to the general council; to fix the fees, to censure, suspend, or deprive of office any member of the senatus, upon sufficient cause shown, and after such sentence of the court has received the sanction of the queen in council; and finally to inquire into and control the pecuniary affairs of the university. The Senatus Academicus or senate consists of the principal and the whole body of professors. It is intrusted with the superintendence and regulation of the teaching and discipline of the university. The general council consists of the chancellor, the members of the university court, the professors, all graduates of the university, besides all who, previous to the 2d of August, 1861, had, as matriculated students, given regular attendance on the course of study in the university for four complete sessions, or for three complete sessions in this and one in any other university. The general council meets twice a year 'to take into their consideration all questions affecting the well-being and prosperity of the university, and to make representations from time to time on such questions to the university court, who shall consider the same, and return to the council their deliverance thereon.' The body of curators consists of seven members, three of whom are nominated by the university court, and four by the town-council.

Some of the professors are appointed by the crown, others are elected by special electors, and a considerable number by the curators, who also elect the principal. Besides those chairs of which the curators have the sole patronage, there are others the patronage of which they share with other electors. The professors, forty-one in number, are arranged under four faculties—theology, law, medicine, and arts—and degrees are granted in each of the faculties.

The course in arts extends over four winter sessions, lasting from the beginning of November till the second Friday in April. By passing a satisfactory examination in Latin and Greek before entering on their course students may obtain a degree in arts after a course of three years, and by attendance at only seven instead of nine classes. The ordinary degree of M.A. is conferred by the senate through the chancellor or vice-chancellor on all who have completed their course and passed the ordinary examinations in the classical department (Latin and Greek), the department of mathematics and natural philosophy, and that of logic and metaphysics, moral philosophy, and rhetoric and English literature. Candidates who have successfully passed the ordinary examinations for the degree of M.A. may obtain honours in any of the departments of classical literature, philosophy, mathematics, and natural science by submitting themselves before graduation to a severer examination in the subjects included in the department in which honours are conferred. Successful candidates for honours are arranged in two classes, called the first and the second. The fee for the degree of M.A. is £3, 3*s*.

Three medical degrees are conferred by the University of Edinburgh—Bachelor of Medicine (M.B.), Master in Surgery (C.M.), and Doctor of Medicine (M.D.) The curriculum which a candidate for the first two degrees must pass through extends over four years. In the medical faculty there are two sessions in each academical year, a winter session and a summer one. The former lasts from November till March inclusive, the latter from May to July inclusive. The degree of Master in Surgery is not conferred on any person who does not also at the same time receive the degree of Bachelor of Medicine. Candidates for the degree of Doctor of Medicine must already have obtained the degree of Bachelor of Medicine, and since obtaining this degree must have practised for at least two years (in the army or navy, in attendance on an hospital, or in ordinary practice), and must be at least twenty-four years of age. Honours may be obtained by candidates for the degree of M.D. as by those for that of M.A., and the successful candidates are similarly arranged in two classes. The fee for the degree of M.B. is £15, 15*s*.; for that of C.M. £5, 5*s*. additional; and for that of M.D. £5, 5*s*. additional to that for M.B. For the last-mentioned degree there is besides a £10 government stamp required.

The degrees in law conferred by Edinburgh University are Bachelor of Laws (LL.B.), Bachelor of the Law of Scotland (B.L.S.), and Doctor of Laws (LL.D.) Candidates for the former degree must be graduates in arts of some British university, or of a colonial or foreign university whose degree is recognized for that purpose by the university court. They must also go through a prescribed course in law at some Scottish university, extending over a period of three academical years, and must successfully pass the necessary examinations. As in the faculty of medicine, there is a summer as well as a winter session in that of law. The fee for the degree of LL.B. is £5, 5*s*. The establishment of the degree of B.L.S. was determined upon by the university court on the 4th of March, 1873. It is intended for such law students as are not graduates in arts. Two years of the law course of candidates for this degree must be passed at Edinburgh. The fee is the same as for LL.B. The degree of LL.D. is purely honorary.

The degrees of Bachelor of Divinity (B.D.) and Doctor of Divinity (D.D.) are bestowed in the faculty of divinity. Candidates for the degree of B.D. must be graduates in arts of some British university, or of a colonial university whose degrees have been specially recognized by the university court. They must also have gone through the theological curriculum of the church to which they belong, and must pass the necessary examinations. In the theological curriculum of the university there are four years of one winter session each. The fee for the degree of B.D. is £3, 3*s*. The degree of D.D., like that of LL.D., is merely honorary.

Besides the degrees already mentioned, degrees in science are also conferred by Edinburgh University. The two degrees conferred under this head are Bachelor of Science (B.Sc.) and Doctor of Science (D.Sc.) The degree of D.Sc. is conferred in phy-

sical and natural science, in engineering, in mental science, and in philology. That of B.Sc. is conferred only in physical and natural science and in engineering. The degree of D.Sc. in these branches is conferred only on those who have already obtained that of B.Sc. Candidates for the degree of B.Sc. must have attended during three academical years classes embracing the subjects included in the science examination which they propose to undergo, and one of these years must be passed at the University of Edinburgh, and they must also be matriculated students of the university for the year in which they appear for examination. Candidates for the degree of D.Sc. may submit themselves for examination after a lapse of twelve months from the date of their taking that of B.Sc. In the department of engineering candidates for this degree must also prove that they have passed under a civil engineer in practice. The total fees for B.Sc. amount to £5, 5*s.*; for D.Sc., in either of these departments, £5, 5*s.* additional. The degree of D.Sc. in the other two departments may be obtained after examination by candidates who are graduates in arts of any British or specially recognized colonial university who have attended at least one academic year at Edinburgh University, and who are matriculated students of the university for the year in which they appear for examination. The fee is in each case £7, 7*s.*

The university buildings comprise the college, a fine building, begun in 1789, a separate music class-room possessing a fine organ, a botanical class-room in connection with the botanic gardens, and an official residence for the principal. In connection with the university there are dissecting-rooms, several laboratories, the royal botanic garden, herbarium and museum, and the natural history museum in the Museum of Science and Art. The library of the university contains about 137,000 printed volumes, besides 700 manuscripts. There is also a separate theological library containing about 10,000 volumes. There are various bursaries, scholarships, and fellowships in connection with the different faculties. Their value varies from about £2, 10*s.* to about £160. They are tenable for periods varying from one to four years. In respect of endowment Edinburgh University is not so well provided for as might be wished, but since the formation in 1861 of the Association for the better Endowment of Edinburgh University a good deal has already been done in the way of founding new chairs, increasing the endowments of those already existing, and founding scholarships, fellowships, &c. Since the passing of the reform bill of 1868 the University of Edinburgh unites with that of St. Andrews in returning one member to Parliament. The constituency consists of the general council.

EDINBURGH REVIEW, The. This celebrated journal was established in 1802, at a time when the periodical literature of the United Kingdom consisted of works conducted with inferior talent, and occupying narrow grounds. Its success was immediate and very great. All the great subjects of literature, science, philosophy, and politics were discussed in it with boldness, spirit, varied learning, acute reasoning, elegant criticism, a piquant satire, and profound and original views. In politics it supported the Whigs, to which party it did good service by disseminating and upholding their views. It was started by a number of young men in Edinburgh who were accustomed to meet occasionally to discuss questions in every branch of science and philosophy. The principal of these were Brougham, Jeffrey, Sydney Smith, and F. Horner. It was edited for a few numbers by the Rev. Sydney Smith; afterwards Jeffrey was the editor from 1803 to 1829, and one of the most fruitful contributors during the long time which he conducted it. During his editorship the periodical reached the highest summit of its prosperity, when it had from 12,000 to 13,000 subscribers. Jeffrey was succeeded by Macvey Napier, afterwards editor of the seventh edition of the Encyclopædia Britannica. His articles related principally to the belles-lettres. Among the principal writers are to be found the distinguished names of Playfair, Leslie, Horner, Walter Scott, Sir W. Hamilton, Mackintosh, Brougham, Dugald Stewart, Dr. Brown, Macculloch, Thomas Carlyle, Macaulay, &c. Playfair wrote the articles relating to Laplace, &c. Sir J. Mackintosh was the author of numerous literary, historical, and political articles, which display the liberal and generous principles, the extensive views, and the varied learning of a statesman and scholar.

EDINGTONITE, a rare mineral discovered in the Kilpatrick Hills, near Glasgow, by Mr. Edington, in 1823. It occurs in small white, translucent, well-formed crystals belonging to the dimetric system. It is moderately hard, and has a specific gravity of 2·7. It is difficultly fusible, and is gelatinized by acids. It is a hydrated silicate of barium and aluminium, containing silica, 36·9; baryta, 26·5; alumina, 22·6; water, 12·4; with small quantities of strontia, lime, and soda. According to another analysis it contains no baryta.

EDITION, the number of copies of a book printed at one impression. The first printed edition of any work is called the *editio princeps;* that which is considered the best is called *editio optima.*

EDMONTON, a village in England, in the county of Middlesex, 7½ miles north of London. An extensive trade in timber is carried on here by means of the Lea River navigation. The 'Bell at Edmonton' has become famous by association with the adventures of John Gilpin. Charles Lamb died at Edmonton on December 27th, 1834. Pop. 13,860.

EDMUND I., King of England, an able and spirited prince, son of Edward the Elder, born about 921, succeeded his brother Athelstan in 941. He conquered Cambria, which he bestowed on Malcolm, king of Scotland, on condition of homage. He was stabbed at a banquet by Liofa, an outlaw, who entered among the guests, and provoked the king to a personal attack upon him. Edmund immediately expired of the wound, May 26, 946.

EDMUND II., surnamed *Ironside,* King of England, was the eldest son of Ethelred II., and was born in 989. On the death of the latter in 1016 he was obliged to take the field against Canute, over whom he gained several victories. He was at last defeated at Assandun, in Essex, in consequence of the defection of Edric, duke of Mercia. A compromise was then effected, by which the midland and northern counties were assigned to Canute, and the southern to Edmund. He soon after died at Oxford, murdered, it is said, at the instigation of the traitor Edric. This event made Canute master of the entire kingdom; but the line of Edmund was again partially restored by the marriage of his great-grand-daughter Matilda to Henry I.

EDMUND, St., King of the East Angles, began to reign in 855; died in 870. He was revered by his subjects for his justice and piety. Till within a short period of his death his kingdom enjoyed peace and prosperity, but in 870 he was attacked, defeated, and taken prisoner by the Danes. He refused the humiliating terms of peace that were offered to him by his conquerors, who on that account caused him to be beheaded. St. Edmund was buried at Beodric's Worth, and a monastery and town gradually grew up round the place of his sepulture, which took from him the name of Bury St. Edmunds.

EDOM, a country mentioned in the Bible, lying to the south of Palestine. The Edomites are said in Genesis to be the descendants of Esau, who was also

called Edom, and who dwelt in Mount Seir, the mountain range now called *Jebel Shera*, stretching between the Dead Sea and the Gulf of Akabah. Their capital was Selah, which is most probably to be identified with Petra, a stronghold hewn out of the rocks in the range of mountains just mentioned. The Edomites were already securely established in their rocky fastnesses when the Israelites left Egypt under Moses, and on that occasion the Edomites refused to allow the descendants of Jacob to pass through their territory. At a later time the Edomites were attacked by Saul and subdued by David. Solomon, under whose reign they in vain attempted to deliver themselves from the Israelitish yoke, fitted out a commercial fleet in their ports. After the separation of the ten tribes they remained subject to the Kingdom of Judah until the reign of Jehoram, when they revolted and secured their independence for a time. They were again subdued about half a century later by Amaziah, who took Selah and gave it the name of *Joktheel* (that is, 'God-subdued'). Under Ahaz the Edomites again made themselves independent, and remained so till the time of the invasion of Judea by Nebuchadnezzar. After the return of the Jews from the captivity, the hereditary hostility between them and the Edomites manifested itself anew. During the revolt of the Maccabees the Edomites made common cause with the Syrians, but about 125 B.C. they were completely subdued and rendered tributary by John Hyrcanus. In New Testament times Edom was called *Idumæa*. Antipater, the governor of Idumæa, was made procurator of Judæa by the Romans, B.C. 47. His son was Herod the Great, the king of Judæa, in whose reign Christ was born.

EDRED, King of England, son of Edward the Elder, succeeded to the throne on the murder of his brother, Edmund I., in May, 946. He quelled a rebellion of the Northumbrian Danes, and compelled Malcolm, king of Scotland, to renew his homage for his English possessions. Although active and warlike he was extremely superstitious and subservient to the celebrated Dunstan, abbot of Glastonbury. Edred died after a reign of nine years, and left the crown to his nephew, Edwy.

EDRISI, ABU-ABDALLAH MOHAMMED, a famous Arabian geographer, a descendant of the ancient princely family of the Edrisites, born about 1100 A.D., at Tetuan, in the modern Marocco (according to others at Ceuta); died about 1180. He studied at the Moorish University of Cordova, after which he travelled through various countries bordering on the shores of the Mediterranean, and visited even France and England. He was then invited to the court of Roger II. of Sicily, where he resided under the patronage of Roger and his successors till his death. He constructed at the request of Roger a terrestrial globe of silver, on which the figure of the earth was shown with as much accuracy as the state of geographical knowledge at the time permitted. He accompanied this with a descriptive treatise bearing the title Nuzhat Almushtâk, which was completed about 1150. An old manuscript of this work was discovered at Paris in 1829, and was published in a French translation by Jaubert, between 1836 and 1840.

EDUCATION. See SCHOOLS.

EDWARD THE ELDER, King of England, son of Alfred the Great, born about 870, succeeded his father in 901. Ethelwald, the son of his father's elder brother, claimed the crown; and an insurrection took place in his favour, but it ended with the death of Ethelwald in battle. The reign of Edward was further distinguished by successes over the Anglicized and foreign Danes. He fortified many inland towns, acquired dominion over Northumbria and East Anglia, and subdued several of the Welsh tribes. He died in 925.

EDWARD, surnamed the *Martyr*, King of England, son of Edgar, succeeded his father, at the age of fifteen, in 975. His step-mother, Elfrida, wished to raise her own son, Ethelred, to the throne, but was opposed by Dunstan, through whose exertions Edward was peaceably crowned. His short reign was chiefly distinguished by the disputes between Dunstan and the foreign monks on one side, and the secular clergy on the other. The young king paid little attention to anything but the chase, which led to his unhappy death. Hunting one day in Dorsetshire he was separated from his attendants, and repaired to Corfe Castle, where Elfrida resided. After paying his respects to her he requested a glass of liquor, and as he was drinking on horseback one of Elfrida's servants gave him a deep stab behind. He immediately set spurs to his horse, but fainting from loss of blood, he was dragged in the stirrup until he died. The pity caused by his innocence and misfortune induced the people to regard him as a martyr. He had reigned four years.

EDWARD, surnamed the *Confessor*, younger son of Ethelred II. On the death of his maternal brother, Hardicanute the Dane, in 1041, he was called to the throne, and thus renewed the Saxon line. He was not the immediate heir, as his brother, Edmund Ironside, had left sons; but as he received the support of Godwin, earl of Kent, on condition of marrying his daughter, Editha, his claim was established. Edward was a weak and superstitious, but well-intentioned prince, who acquired the love of his subjects by his monkish sanctity and care in the administration of justice. He gained the title of saint and confessor by abstaining from nuptial connection with his queen. Having been educated in Normandy he introduced so many natives of that country to his court, that the French language and manners became prevalent in England to the great disgust of Earl Godwin and his sons. A rebellion took place, and Edward was forced to dismiss his foreign favourites. Perceiving that the youth and weakness of his son, Edgar Atheling, would not secure the succession against the power and ability of Harold, the son of Godwin, he turned his eyes upon his kinsman, William of Normandy, in whose favour it has been asserted that he executed a will. He died in 1066, leaving the point of the succession undetermined; and with him ended the Saxon line of kings. He caused a body of laws to be compiled from those of Ethelbert, Ina, and Alfred, to which the nation was long fondly attached. He was canonized by Alexander III. in 1166.

EDWARD, Prince of Wales, surnamed the *Black Prince*, one of the most chivalric and heroic characters of history, the eldest son of Edward III. and Philippa of Hainault. He was born in 1330, and at the age of fifteen accompanied his father in his invasion of France, and received from him the honour of knighthood. The victory of Crecy (August 26, 1346), which King Edward left principally to the exertions of the force under his son's command, to use that warlike king's language, 'showed that he merited his spurs.' It was on this occasion that he assumed the motto of *Ich dien* (I serve), used by all succeeding princes of Wales, and derived, it is said, from the crest of the King of Bohemia, slain in that battle, which tradition, however, later antiquaries seem disposed to discredit. In 1355 he commanded the army which invaded France from Gascony, and the next year fought the great battle of Poictiers (see EDWARD III.), and distinguished himself by the courtesy with which he treated his prisoner, King John. By the Peace of Bretigny his father had ob-

tained the provinces of Poictou, Saintonge, Périgord, Limousin, &c., which he annexed to Guienne and formed into a sovereignty for his son, under the title of the Principality of Aquitaine. There the prince took up his residence; and at his court Pedro the Cruel sought refuge, when driven from his throne by his natural brother, Henry of Trastamare. Edward undertook the re-establishment of this tyrant, which he accomplished, but lost his health in the enterprise. Disappointed, by the perfidy of Pedro, of the stipulated reimbursements, the taxes he was obliged to levy on his new subjects rendered his government unpopular; and an appeal was made to the King of France, as his liege lord, who summoned him as his vassal to appear at Paris. 'I will come,' replied the angry prince, 'but it shall be at the head of 60,000 men.' His health, however, was too far declined to enable him to take the field, when the King of France invaded his dominions; and having suffered the mortification of seeing his generals defeated, he withdrew into England, and after lingering some time died (1376) in his forty-sixth year, leaving an only son, afterwards Richard II.

EDWARD, PRINCE CHARLES. See CHARLES EDWARD STUART.

EDWARD I. (of the Norman line), King of England, son of Henry III., was born at Winchester in 1239. The contests between his father and the barons called him early into active life, and he finally quelled all resistance to the royal authority by the decisive defeat of Leicester, at the battle of Evesham, in 1265. He then proceeded to Palestine, where he signalized his valour on many occasions, and inspired so much terror that an assassin was employed to despatch him, from whom he received a wound in the arm, which, as tradition reports, being supposed to be from a poisoned weapon, was sucked by his faithful consort, Eleanor of Castile. On assuming the government he acted with great vigour in the repression of the lawlessness of the nobles and the corruption in the administration of justice; but often evinced an arbitrary and grasping disposition. In 1274, and again in 1276, he summoned Llewellyn, prince of Wales, to do him homage, and upon his refusal, except on certain conditions, commenced the war which ended in the annexation of that principality to the English crown in 1283. Edward then spent some time abroad in mediating a peace between the crowns of France and Arragon, and on his return commenced his attempts to destroy the independence of Scotland. After his return from the Scottish expedition in 1296, which terminated in the capture of Baliol, he became involved in a quarrel with his clergy, who, supported by the pope, refused to submit to a tax which he had imposed on them. Edward forced their compliance by placing them out of the protection of the law. His frequent expedients to raise money at length produced great discontent among the nobles and people also, which obliged him to confirm the great charter and charter of forests, and also to give other securities in favour of public liberty. He then made a campaign in Flanders against France, which terminated with the recovery of Guienne and his second marriage with Margaret, the sister of King Philip. Meantime new commotions took place in Scotland under the guidance of the celebrated William Wallace. These transactions recalled Edward from Flanders, who hastened to the borders with an army of 100,000 men. The events of this interesting campaign cannot be detailed here; but the ignominious execution of the brave Wallace, in 1305, as a traitor, forms a blot in the character of Edward. Neither did it avail, since Robert Bruce was able, in 1306, to place himself at the head of a new confederacy. Highly indignant at this determined spirit of resistance Edward vowed revenge against the whole Scottish nation, and, assembling another army, was on the point of passing the border when he was arrested by sickness and died at Burgh-upon-Sands, near Carlisle, July 7, 1307. Few princes have exhibited more vigour in action, or policy in council, than Edward I. His enterprises were directed to permanent advantages rather than to mere personal ambition and temporary splendour. Nor was he less intent upon the internal improvement of his kingdom than its external importance. The laws of the realm obtained so much additional order and precision during his reign that he has been called the *English Justinian*. He passed an act of mortmain, protected and encouraged commerce; and in his reign first originated the society of merchant adventurers. The manners of this able sovereign were courteous, and his person majestic, although the disproportionate length of his legs gave him the popular surname of *Longshanks*. He left a son and three daughters by his first wife, Eleanor, who died in 1290, and two sons by his second wife, Margaret of France.

EDWARD II., King of England, born at Caernarvon Castle in 1284, and the first English Prince of Wales, suceeded his father, Edward I., in 1307. He was of an agreeable figure and mild disposition, but indolent and fond of pleasure. After marching as far as Cumnock, in Ayrshire, with the army collected by his father, he returned, dismissed his troops, and abandoned himself entirely to amusement. His first step was to recall Piers Gaveston, a young Gascon, whom his father had banished, and whom he created Earl of Cornwall, and married to his niece. He then went over to France to espouse the Princess Isabella, to whom he had been contracted by his father, leaving Gaveston guardian of the realm. Soon after his return the barons associated against the favourite, whom they more than once obliged the king to send away. He was, however, as constantly recalled when the immediate danger was over, until an open rebellion took place; and, the person of Gaveston being captured, he was executed as a public enemy. In 1314 Edward assembled an immense army to check the progress of Robert Bruce, but was completely defeated at Bannockburn. After the death of Gaveston he selected a similar minion in the person of Hugh le Despenser, a young nobleman, upon whom he lavished favours of every kind, until the barons again rebelled, and the Parliament dooming Despenser and his father to exile, the king was obliged to confirm the sentence. Edward, however, on this occasion, in concert with the Despensers, contrived to raise troops and attack the barons, at the head of whom was his cousin the Earl of Lancaster, who, being taken prisoner, was executed at Pomfret. Several others also suffered, and the favourites were enriched with the spoils. Edward subsequently made another fruitless attempt against Scotland, which ended in the conclusion of a truce of thirteen years. In 1324 Queen Isabella went to France to settle some disputes in relation to Guienne, and while there, entered into a correspondence with several English fugitives, in whose hatred to the Despensers she participated. Among these was Roger Mortimer, a young baron of the Welsh marches, between whom and Isabella a criminal intercourse followed, in consequence of which the queen was still more determined upon the ruin of her weak and unhappy husband. Having formed an association with all the English malcontents, and being aided with a force by the Count of Hainault, she embarked for England in September, 1326, and landed in Suffolk. Her forces seized the Tower of London and other fortresses, captured and executed both the Dispensers

without trial, and at length took the king prisoner, who had concealed himself in Wales, with a view of escaping to Ireland. The unfortunate Edward was confined in Kenilworth Castle, and in January, 1327, his deposition was unanimously voted in Parliament, on the ground of incapacity and misgovernment. A resignation of the crown was soon after extorted from him, and he was transferred to Berkeley Castle, where Mortimer despatched two ruffians, who, it is said, murdered him by thrusting a red-hot iron into his bowels, that no external marks of violence might remain, 21st of September, 1327, in the twentieth year of his reign and forty-third of his age.

EDWARD III., son of Edward II., by Isabella of France, was born in 1313. On his father's deposition in 1327, he was proclaimed king under council of regency, while his mother's paramour, Mortimer, really possessed the principal power in the state. The pride and oppression of Mortimer now became so intolerable, that a general confederacy was formed against him, at the head of which was the young king himself, who, now in his eighteenth year, could ill brook the ascendency of his mother's minion. The result was the seizure of Mortimer (10th Oct. 1330), in the castle of Nottingham, where he lodged with the queen. He was tried and condemned by a Parliament at Westminster, and was executed 29th Nov. The queen was also confined to her manor at Risings, with a reduced allowance, and although treated with outward respect, never again during the remaining twenty-eight years of her life recovered any degree of authority. Edward now turned his attention to Scotland. Assisted by some principal English nobles, who enjoyed estates in that country which were withheld from them contrary to the terms of the late treaty, Edward Baliol, son of the John Baliol to whom the crown had been awarded by Edward I., raised a force, and defeating the Scots in a great battle, set aside David Bruce, then a minor, and was crowned at Scone in 1332. Baliol being driven away on the departure of his English auxiliaries, applied to Edward, who levied a well-appointed army, with which he defeated the regent, Douglas, at the famous battle of Halidon Hill, in July, 1333. This victory produced the restoration of Baliol, who was, however, again expelled, and again restored, until the ambition of Edward was called off by a still more splendid object. The crown of France, by the Salique law, having devolved to Philip de Valois, cousin-german to the deceased king, Charles the Fair, Edward was induced to claim it in right of his mother, that monarch's sister. There existed other claims that were superior; but these considerations weighed very little with a young, ambitious monarch, eager for conquest and glory. The first hostilities produced nothing of much moment. Edward, in order to obtain fresh supplies, made concessions to Parliament which he never intended to keep; and finding his territory of Guienne threatened, he sent over a force for its defence, and quickly followed himself, accompanied by his son Edward, the famous Black Prince, all his chief nobility, and 30,000 men. The memorable battle of Crécy followed, August 25, 1346, which was succeeded by the siege of Calais. In the meantime, David Bruce, having recovered the throne of Scotland, made an incursion, at the head of a large army, into England; but being met at Durham by a much inferior force, raised by Queen Philippa, and headed by Lord Percy, he was totally defeated and taken prisoner, with many of his principal nobles. Philippa went over to her husband at Calais, and, by her interference prevented the barbarous execution of Eustache de St. Pierre and five other citizens, whom Edward, on the capitulation of the place, had determined to execute, in revenge for his long detention in the siege. In 1348 a truce was concluded with France. The year 1349 was distinguished by the institution of the order of the Garter, which, owing to the fame and chivalrous character of Edward and his eldest son, soon became one of the most illustrious orders of knighthood in Europe. Philip, king of France, dying in 1350, was succeeded by his son John, the commencement of whose reign abounded with intestine commotion, and in 1355 Edward again invaded France on the side of Calais, while the Black Prince at the same time led a large army from Gascony. Both these expeditions were attended with much plunder and devastation; and Edward, being recalled home by a Scottish inroad, soon repelled it, and retaliated by carrying fire and sword from Berwick to Edinburgh. During this time the Prince of Wales had penetrated from Guienne to the heart of France, where he was opposed by King John, at the head of an army nearly five times more numerous than that of the English. The famous battle of Poictiers ensued, in which the French monarch being taken prisoner, Edward held at the same time in captivity the Kings of France and Scotland, the most dangerous of his enemies. John was taken to England and treated with the greatest respect; and David was soon after liberated upon ransom. A truce had been made with France after the battle of Poictiers, at the expiration of which, in 1359, Edward once more passed over to Calais with a large army, and desolated the provinces of Picardy and Champagne, but at length consented to a peace, which was concluded in May, 1360. Besides the stipulation of a large ransom for King John, several provinces and districts in the south-west of France and neighbourhood of Calais were yielded to Edward, who in his turn resigned his title to the crown of France and duchy of Normandy. The successor of John, Charles V., invaded the provinces intrusted to Prince Edward, then in the last stage of declining health, and Edward had the mortification of witnessing the gradual loss of all his French possessions, except Bordeaux and Bayonne, and of all his conquests except Calais. In the decline of life he was in other respects unfortunate; becoming a widower, he fell into a species of dotage; and an artful mistress, named Alice Perrers, so abused her influence, that on a parliamentary remonstrance, he found it necessary to dismiss her. His administration also became unpopular; and he had the affliction of witnessing his heroic son, Edward, sink a victim to a lingering illness; which calamity he survived about a year, dying June 21, 1377, in the sixty-fifth year of his age, and fifty-first of his reign.

EDWARD IV., King of England, was born in 1441. His father, Richard, duke of York, was grandson of Edward, earl of Cambridge and duke of York, fourth son of Edward III., while the Lancaster branch descended from John of Gaunt, the third son. The York line had intermarried with the female descendants of Lionel, the second son, which gave it the preferable right to the crown. Edward, on the defeat and death of his father at the battle of Wakefield, assumed his title, and having entered London after his splendid victory over the Lancastrians at Mortimer's Cross, in Feb. 1461, was declared king by acclamation. Soon after his accession he had to fight for his crown against an army of 60,000 Lancastrians assembled in Yorkshire; and the field of Towton confirmed his title by a decisive victory. Although the high-spirited Margaret was enabled by the aid of Louis XI. of France again to take the field, the result of the battle of Hexham, in May, 1464, obliged her to return to Flanders, and leave her husband, the imbecile Henry, a prisoner in the hands of his enemies. Freed from warlike cares Edward indulged himself in the gallantries too common

to his age and station, and by a marriage with Elizabeth Woodville, widow of Sir John Grey of Groby, a Lancastrian, plunged himself into very serious difficulties, since at the same time he had despatched the Earl of Warwick to negotiate a marriage for him with Bona, sister to the Queen of France; so that he at once offended two royal houses and his powerful friend Warwick. Aided by France, Warwick, who had contracted his daughter to the Lancastrian Prince Edward, landed with Clarence and some other lords at Dartmouth; and quickly saw himself at the head of 60,000 men, with whom he marched to encounter Edward. They approached each other near Nottingham, where the king, by the treachery of the Marquis of Montague, in whom he placed great confidence, had nearly been betrayed into the hands of his enemies. He had just time to mount and ride to Lynn, where he instantly embarked, and reached a port in Holland, leaving Warwick in full possession of his kingdom, eleven days after he had set his foot in it. Henry's title was again recognized by Parliament, and Warwick and Clarence were declared regents of the kingdom. Edward, who at first had been received rather coldly by his brother-in-law, the Duke of Burgundy, was at length secretly assisted by him with a small squadron of ships, and a force of about 2000 men, with which he safely reached Ravenspur, in Yorkshire. Here his forces quickly increased by partisans from all quarters, and he was soon enabled to march to London, where he obtained entrance as king, and the unfortunate Henry again became prisoner. Warwick advanced against him as far as Barnet, where, on the 4th of April, 1471, another great battle was fought, which ended in the death of Warwick, and a decisive victory on the part of Edward. On the same day Queen Margaret and her son landed at Weymouth, and marched into Gloucestershire, where she was met by the victorious Edward, who totally defeated her at Tewkesbury. The queen and her son Edward being taken prisoners and brought into the presence of the victor, Edward asked the latter how he dared to invade his dominions. On receiving a spirited answer he basely struck the captive prince on the face with his gauntlet—the signal for immediate massacre by the king's brothers and other nobles attendant. Margaret was thrown into the Tower, where Henry VI. soon after died, but whether by violence or by disease is uncertain. Edward now once more gave himself up to pleasure until seized with a desire to make French conquests. Baffled by the arts and intrigues of Louis XI. these attempts ended in nothing of importance. The latter part of his reign was disturbed by his jealousy of his brother Clarence, whom he latterly got condemned and put to death, it is said by drowning in a butt of Malmsey wine. Edward was preparing for another expedition against France, when he was taken off by sickness in April, 1483, in the forty-second year of his age, and twenty-third of his reign.

EDWARD V., King of England, the eldest son of Edward IV., was in his thirteenth year when he succeeded his father in 1483. He fell into the hands of his uncle, the Duke of Gloucester, the regent, who caused the young king and his brother to be sent to the Tower, and, it is said, had them smothered by ruffians. Two bodies, answering their description, being found buried at the foot of the stairs of their apartment, in the reign of Charles II., were taken up by that king's order, and deposited in Westminster Abbey.

EDWARD VI., King of England, son of Henry VIII. by Jane Seymour, was born in 1537. At his father's death he was only ten years of age, and as he did not live to attain majority, the public acts of his reign are to be deemed those of his counsellors. His education was intrusted to men of the first character for learning, among whom were Sir Anthony Cooke and Sir John Cheke. The progress of the docile and amiable young king was great, especially in classical acquirements, and he was animated with a rooted zeal for the doctrines of the Reformation. His reign was, on the whole, tumultuous and unsettled. After his father's death his maternal uncle, Seymour, duke of Somerset, became protector, but his administration raised up such powerful enemies that he was brought to the scaffold. Edward was much afflicted at the necessity of consenting to his execution, and with equal reluctance consented to the death of a fanatical female, named Joan Bocher, who was sentenced to the flames for heresy. After the death of Somerset, Dudley, duke of Northumberland, became all-powerful, and through his influence Edward, in a declining state of health, was induced to set aside the succession of both his sisters, and to settle the crown upon Lady Jane Grey, claiming through his father's younger sister, the Duchess of Suffolk. His decease, from a pulmonary complaint, soon after followed, July 6, 1553, in the sixteenth year of his age and seventh of his reign.

EDWARDS, Bryan, the historian of the West Indies, was born at Westbury, in Wiltshire, in 1743. On the death of his father he was taken under the care of an uncle in Jamaica, who left him a large fortune. After a successful mercantile career he returned to England, and in 1796 took his seat for the borough of Grampound, which he represented until his death, in July, 1800. His first publication was a pamphlet, entitled Thoughts on the Trade of the West India Islands with the United States, 1784; this was followed by his Speech on the Slave-trade; but his most distinguished performance is his History, Civil and Commercial, of the British Colonies in the West Indies, 1793, two vols. 4to. A new edition of this work, published after his death, in 1801, three vols. 8vo, includes a history of St. Domingo. Mr. Edwards also published in 1796 the Proceedings of the Governor and Assembly of Jamaica in regard to the Maroon Negroes, 8vo. All these works are valuable for their information, and are written with ease and elegance.

EDWARDS, Jonathan, the most celebrated of American metaphysicians and theologians, whom Dugald Stewart describes as 'indisputably the ablest champion of the scheme of necessity since the time of Collins,' was born at East Windsor, Connecticut, October 5, 1703. His father, a minister of the gospel, instructed him in the dead languages. Jonathan entered Yale College, Newhaven, in September, 1716, and after taking his degree in 1720, remained nearly two years at Yale, preparing for the ministry. In 1722 he went to New York, where he preached for about eight months with great distinction. In September, 1723, he was elected a tutor in Yale College, and in the following year began to act in that capacity, but resigned his office in 1726, in order to become minister at Northampton (Massachusetts), where he was ordained February 15, 1727. His various sermons and disquisitions procured for him a wide reputation. His Treatise on Religious Affections was immediately republished in England and Scotland, and placed him among the first writers of his sect. After more than twenty-three years of zealous service in Northampton, a total rupture occurred between him and his congregation, owing to the candour and boldness with which he publicly reproved certain irregularities of some young persons of the principal families connected with his church. An ecclesiastical council dismissed him in June, 1750; and in the following year he accepted a call to serve

as a missionary among the Indians at Stockbridge, in Massachusetts. Here he remained six years, exerting himself with an apostolical spirit, and at the same time prosecuting the deepest investigations in mental philosophy. Here he composed his famous works on the Freedom of the Will, and on Original Sin. The first is his masterpiece, and worthy of the powers of a Locke or Leibnitz. It was completed within the space of four months and a half. The date of its first appearance is the early part of 1754. In 1757 he was chosen president of the college at Princeton, New Jersey, and accepted this invitation, though not without reluctance, on account chiefly of his desire to accomplish two great literary enterprises which he had begun long before—a History of the Work of Redemption, and a View of the Harmony of the Old and New Testaments. In January, 1758, he repaired to Princeton, where he died March 22, 1758, in the fifty-fifth year of his age.

EDWIN, King of Northumbria, was the son of Ella, who seems to have ruled that kingdom from 559 to 589. Being an infant at his father's death the crown was seized by Ethelfrith of Bernicia. The young prince was sent for protection to the court of Redwald, king of East Anglia, by whose aid he was eventually put upon the throne (617). He married Ethelburga, daughter of Ethelbert of Kent, and by her influence and that of Paulinus, a Roman missionary, whom she had brought from her father's court, he was led to embrace Christianity, and make it the religion of his people. He was baptized in 627 at York, where he built the first church of wood. He did not long survive these events. The Mercians, under their king, Penda, revolted against the supremacy claimed by the Northumbrians; and the war which ensued was closed by a battle at Heathfield, or Hatfield, in Yorkshire, in which Edwin was defeated and slain (633).

EDWY, King of England, son of Edmund I., succeeded his uncle Edred in 955. Taking part with the secular clergy against the monks, he incurred the confirmed enmity of the latter. Having called Dunstan to account for his share in the administration in the preceding reign, the latter refused to attend the summons, and was in consequence banished. His party was, however, so strong that a rebellion was excited, and Edwy driven from the throne, to make way for his brother Edgar. That his marriage with Elgiva, his near relation, may have given a pretence for his deposition and excommunication is very probable, but there is reason to believe that the personal enmity of Dunstan and Odo, the leaders of the Papal party, was the real cause. His beautiful and unfortunate queen was seized by Odo's retainers, branded in the face to destroy her beauty, and transported to Ireland. In a short time she returned, cured of her cruel wounds, but was again captured, and was put to death by shameful torture (957). Edwy died in the following year, when he could not have been more than eighteen or nineteen years old.

EECLOO, a town, Belgium, province of East Flanders, 11 miles north-west from Ghent, near the Lièvе, a canalized stream. It is a clean place, well built, and the seat of manufactures of woollens, cottons, hats, tobacco, chocolate, soap, starch, &c.; and has breweries, distilleries, vinegar works, salt-refineries, dyeworks, and oil-mills; and an active trade in grain, linen, cattle, and timber. Pop. 9564.

EEL, a fish well known from its peculiar form and savoury flesh. Many varieties of eels are described by naturalists, some tenants of fresh-water streams, others inhabiting the sea. The latter acquire a vast size, and numerous instances are on record of their having attacked and overpowered boys and even men, while bathing. Gifted with prodigious strength and agility, and capable of inflicting severe wounds with its powerful jaws, the sea-eel, or conger, must prove a most dangerous assailant, when encountered in its native element. Fresh-water eels, inhabiting running streams with gravelly bottoms, are said to be uniformly white upon the belly, and infinitely more delicate than those of muddy waters, which are always yellow, and possess a peculiar smell, and a very disagreeable flavour. In the choice of its food the eel is far from cleanly, feeding indiscriminately upon all kinds of small fish, and decayed animal matter; in consequence of which many persons refuse to eat them. In the seas of India there are large species caught, varied with the most beautiful colours, resembling serpents; and one in particular has so much the aspect of one of these reptiles as to bear the name of *snake-eel*. The flesh of eels is sapid and nourishing, but owing to its fatness, offensive to weak stomachs. Oil is procured from sea-eels, which is remarkably clear, and burns very brightly. A curious opinion formerly prevailed that a strip of eel-skin tied round the ankle would prevent the cramp, so dangerous to bathers. The voracity of the Mediterranean eel (*Muræna Helena*) led to the belief that it fed on human flesh; and more than one wealthy and unpopular Roman is said to have thrown his slaves into the fish-pond for the double purpose of punishing offenders and of improving the flavour of the fish. Vedius Pollio, in particular, is well known as having been guilty of this cruelty. *Muræna* was the term used to express the female eel, and *myrus* the male. The common eel belongs to the subgenus *Muræna* of Lacepède, and may be distinguished thus: dorsal fin commencing very much in the rear of the pectorals, and becoming continuous round the tip of the tail with the anal; upper jaw shorter; colour, olive-green above, silvery or yellowish beneath. In the sea-eels, or congers, which some regard as a separate genus, the dorsal commences near the pectorals, or over them, and the superior jaw is always longest. The conger of our seas attains the length of 5 or 6 feet, and the thickness of a man's leg. A prejudice exists in America against the flesh, which in Europe is salted in large quantities. Few animals are more tenacious of life; they continue to move for a long while when deprived of the head and skin, preserving the muscular irritability for many hours after death. Great quantities of river eels are consumed for food among the lower classes, and the numbers taken during a night, in a trap contrived for the purpose, and sunk upon the bottom, is frequently enormous, amounting to several hundreds. A barrel or box is used, having an aperture cut in the top, to which is attached a stocking or tube of coarse cloth, which hangs down in the interior; the fish enter with ease from without, but find it impossible to return. At daylight the trap is raised to the surface and the captives secured. In England a kind of trident is used, called an *eel-spear*. A fisherman wades to the shallows, and striking his spear in the mud in every direction around him, the eels, reposing on the bottom, are caught between the prongs, and shaken into a basket. The respiration in the eel family proper (Murænoidei) is conducted through lateral openings at the gills, as in other fishes; but in the allied family Symbranchii the gill chamber opens by a single orifice under the throat. A great variety is observable in the form of the air-bladder of these fishes, which is wanting only in a few species; when present its cavity is divided by septa which contain vascular networks. Want of scales is usually mentioned as a characteristic of the family, but nevertheless inaccurately. Scales do exist; but they are very minute, and so imbedded in the skin as to be imperceptible in the recent animal, though sufficiently

evident in the dried skin. Some marvellous accounts are on record of the migrations of eels from one river to another over intervening portions of dry land. It is sufficiently well known that such journeys are taken by these fish, and mostly over very small portions of soil covered with damp grass, hence the stories of showers of eels and the like. The migrations of eels to and from the sea are probably undertaken to avoid the cold of fresh-water streams in winter. The mud of brackish estuaries is especially attractive to them, its temperature being one or two degrees higher than that of the sea. Fresh-water eels spawn in spring, the conger in winter. Three (perhaps four) species of eels are natives of this country.

EFFENDI, a corruption of the Greek word *authentēs*, which signifies lord or master in the modern dialect. It is a term of modern use in the Turkish language, and has been substituted for the Tartar word *chelebi* (noble), now applied to persons of inferior rank. Effendi is particularly applied to the civil, as *aga* is to the military officers of the sultan, and both are used in conversation commonly joined to the name of their office. Thus the sultan's first physician is called *Hakim effendi*, the priest in the seraglio *Iman effendi*, &c. The *Reis effendi*, or chancellor of the empire, is also minister of foreign affairs, and negotiates with the ambassadors and interpreters of foreign nations. Greek children are in the habit of calling their fathers *effendi*. The term is often used much in the same way as *Sir*, while the Greek *kurios* may be compared to our *Mr*.

EFFERVESCENCE, the rapid escape of a gas from a liquid, producing a turbulent motion in it, and causing it to boil up. It is produced by the actual formation of a gas in the liquid, as in fermentation, or by the liberation of a gas from a substance containing it, as in the decomposition of marble or carbonate of sodium by an acid, and by the solution of zinc or iron in an acid, or by subjecting a liquid saturated with the gas to a diminished pressure, as in the opening of a soda-water or champagne bottle.

EFFIGY, To Execute or Degrade in. The word effigy is derived from the Latin *effigies*, picture; and the phrase at the head of this article denotes the execution or degradation of a condemned criminal, when he cannot be personally apprehended, by subjecting his image to the formalities of an execution; for instance, affixing the image with a rope round the neck to the gallows (hanging in effigy). This practice is not altogether extinct in Prussia, and probably in other countries; but in England it has become merely a mode in which the populace expresses its feelings respecting an obnoxious personage; such as the English custom of parading and burning the effigy of Guy Fawkes on the 5th of November.

EFFLORESCENCE, a term applied to crystals, which, on exposure to the air, lose water of crystallization and crumble down into a powder. The most familiar instance is that presented by the glassy crystals of washing soda, which become white and pulverulent in the air. The same phenomenon is also presented by Glauber's salt, phosphate of sodium, borax, and other compounds. Another application of the word is to the fine white, feathery crystallization of sulphate and carbonate of sodium which appears on walls, or similar crystallizations on the surface of the earth, in decomposing rocks, &c. In all these cases the salt is in solution in water, the fluid is drawn by capillary attraction to the surface, evaporation takes place, and the salt crystallizes. Afterwards the crystals themselves lose water and effloresce in the other sense of the term. Efflorescence is in some respects the opposite of deliquescence, and the difference is shown by placing an efflorescent and deliquescent body under a bell-jar. The former gives up its water, which the latter absorbs, becoming thereby fluid. But in reality the term is only relative to the circumstances in which the phenomenon usually takes place. Efflorescence occurs only when the tension of the vapour emitted by the salt at the temperature is greater than that of the vapour in the air at the time. And as this seems to be universally the case with carbonate and sulphate of sodium, efflorescence is looked upon as their natural condition. But if the effloresced salt be exposed to air in which the tension of the vapour is greater than that of the vapour it would give off at the temperature, then the salt will reabsorb water from the air.

EGBERT, considered the first king of all England, was of the royal family of Wessex. On the death of Alchmund, the former king, Brihtric, a powerful noble, succeeding in ousting Egbert, who had the best claim to the throne, and who was compelled to take refuge first in the court of Offa of Mercia, then in that of Charlemagne. On the death of Brihtric he succeeded him as King of Wessex, in 800. He reduced the other kingdoms, and rendered them dependent on him, in 827. He was much annoyed by the repeated inroads of the Danes. Egbert died in 838.

EGEDE, Hans, the apostle of Greenland, was born in 1686 at Harstad in Norway, and in 1707 became a preacher at Wogen. Having heard that Christianity had been once established in Greenland, but had become extinct in the country for want of teachers, he was filled with grief. After the most careful inquiry, he heard that the eastern coast of Greenland was inaccessible on account of the floating ice, and that the southern was inhabited by savages. He resolved to visit the country, and to preach the gospel to the inhabitants. Having collected some money to aid him in his purpose, he resigned his charge, received from the Danish government, after the conclusion of peace with Sweden, the title of royal missionary to Greenland, with a small pension and three ships, one to remain with him, another to bring back the news of his arrival, and a third to engage in the whale-fishery. On May 21, 1721, Egede embarked, with forty-six persons under his command. The whaling vessel was wrecked; the other two reached Greenland, where Egede landed on June 4. The conversion of the Greenlanders was now undertaken, but offered great difficulties; and the whole colony, tired of struggling against misery and wretchedness of every description, were eager to return to Denmark. Egede resolved to adopt that course; but the firmness of his wife prevailed upon them all to remain, and the arrival of two ships from Denmark set them at their ease. Egede took up his residence, with his two sons, among the natives, in order to learn their language, and so be able to carry out his project of conversion. He carefully noted down every word of which he discovered the meaning; he often performed long journeys, at the peril of his life, to visit the remotest Greenlanders, for the purpose of gaining their confidence, in which he succeeded by a thousand acts of kindness. After spending fifteen years in Greenland, amid innumerable discouragements, he returned in 1736 to Copenhagen, to make new exertions for the support of Christianity in that country. The government appointed him director of the Greenland missions, and established his son Paul in the office of missionary there. When age rendered him incapable of the exercise of his duties, he retired to the island of Falster, where he died, 1758. His writings are in Danish, and relate to the natural history of Greenland, and his sufferings and adventures there. His son, Paul Egede, born 1708, was his assistant from the time he was twelve years old. Notwithstanding

a strong inclination for the naval service, he submitted to the wishes of his father, studied divinity, and took charge of the mission in Greenland. In this undertaking he embarked in 1734, carried out with him new colonists, and remained there till 1740. He then returned to Copenhagen, received the office of chaplain in the hospital dedicated to the Holy Ghost, and was commissioned, also, to direct the affairs of the mission. The next year he was appointed by the king Bishop of Greenland. He died in 1789. We have from him an Account of Greenland, extracted from a Journal kept from 1721 to 1788, published at Copenhagen, 1789, 12mo; moreover, a Dictionarium Grœnlandicum (Copenhagen, 1754); a Grammatica Grœnlandica; a translation of the Gospels, the Pentateuch, several Danish prayers and liturgies, and the Imitation of Christ, by Thomas a Kempis, in the Greenland tongue.

EGER, EGRA, or CHEBBE, a town, Bohemia, circle of Elnbogen, on a rocky eminence above the Eger, 91 miles west of Prague; pop. 13,463. It was once an important fortress, though only parts of its walls now remain in a very dilapidated state, and its old castle, finely situated on a height, and once the residence of kings and emperors, is completely dismantled and crumbling into ruins. Among the existing edifices are a beautiful church, an ancient town-house, and a gymnasium. Eger has manufactures of broadcloth, kerseymeres, cottons, chintz, leather, soap, &c. The celebrated Wallenstein was assassinated here (1634). A fine avenue, 3 miles long, leads from Eger to the celebrated watering-place of Franzensbrunnen.

EGER, a river which rises in Bavaria 12 miles north-west of the above town, flows first south-east, then takes a north-easterly direction, and falls into the Elbe near Leitmeritz, in Bohemia, after a course of 124 miles.

EGERIA, a nymph who received divine honours among the Romans. Numa is said to have had secret conversations with her, and to have received from her the laws which he gave to the Romans. Some say Egeria was the wife of Numa.

EGERTON, FRANCIS. See BRIDGEWATER (DUKE OF).

EGG. Birds, reptiles, fishes, insects, and worms, bring forth eggs; birds, indeed, without any exception. The eggs of fishes are called *roe* or *spawn*. They contain the germ of the young animal, and, in this respect, resemble the seeds of plants. Seeds require heat and moisture to develop them; and a great part of their substance serves for the nourishment of the germ. So it is with eggs, which have, in addition, the necessary moisture in themselves, and, therefore, only need external heat for their development. The bird's egg consists (1) of the shell. Immediately beneath this hard, porous covering lies firmly inclosed (2) the external membrane, or *membrana putaminis*, which is also a little porous. Next comes (3) the white of the egg, or *albumen*, and, lastly (4), the yolk, or *vitellium*. In the yolk is seen a small, lens-shaped speck, in which is found a little oval sack, of a grayish colour. This is the place where the young animal is developed. The form of the eggs of birds is generally more or less of an oblong spheroid. It is different in other oviparous animals. Amongst reptiles, the crocodile, for instance, has a cone-shaped egg. There is a great variety of shades in the colours of birds' eggs, though they are confined chiefly to white, blue, and green. The spots, points, or stripes, with which many are marked, run in countless degrees and shades, from red into gray, ash-coloured, &c. The eggs of birds, especially of hens, are a pleasant and nutritive food. Among reptiles, turtles produce eggs which are good for eating. The roe of fishes is also eaten, and caviare is composed wholly of the eggs of fish. The white of hens' eggs is used for applications in complaints of the eyes. It is also made use of for clarifying certain liquors, whey, sugar, &c. (See CLARIFICATION.) The simple white of eggs also furnishes a shining varnish for many works of art, especially paintings and playing-cards. Mixed with powdered, fresh-burned lime, with brick-dust, clay, meal, and other substances, according to circumstances, it forms a very strong cement. To preserve eggs for any length of time, they must be kept from the air. They are covered with varnish or oil, set on the small end upon a perforated board, or, which is still better, they are placed in layers, upon the small end, in very dry ashes, in chopped straw, &c., inclosed in tubs and boxes, and put in a dry place, protected from severe cold in winter, but at the same time not too warm. (See INCUBATION.) Eggs are of considerable importance in a commercial point of view. Vast quantities are brought from the country to the large towns, but not in sufficient numbers for the demand, and they are largely imported from the Continent. There was formerly a duty on eggs of 8*d.* per cubic foot (about 200). In 1858, the year of its repeal, this duty produced £24,721. In the year 1872 there were 531,591,720 eggs valued at £1,762,600 imported from the Continent, four-fifths of which came from France.

EGG, COMPOSITION OF. The composition of eggs has attracted much attention, and especially the changes they go through in hatching. The eggs of birds have been the most carefully examined. The shells contain 92 to 95 per cent. of carbonate of calcium, 0·5 to 1·5 per cent. of carbonate of magnesium, 0·5 to 1·5 per cent. of phosphates, 3·5 to 6·5 per cent. of organic matter. The membrane contains carbon, hydrogen, nitrogen, oxygen, and sulphur. The white has an alkaline reaction, and consists of water, albumin, olein, palmitin, oleate and palmitate of sodium, glucose and extractive matter. The inorganic matter consists of alkaline chlorides and phosphates, lime, magnesia, ferric oxide, carbonic and sulphuric acids, silicic acid, fluorine, and gases. The white is inclosed in a fine, structureless membrane, which spreads through it in all directions, and which can be separated by whipping and then dropping the white into water, when it separates in white flocks, but can be partially redissolved by common salt. When the white of egg is warmed it coagulates to a firm opaque mass; and the albumin is also precipitated by acetic acid, added until the previously alkaline solution is acid. A white precipitate is also produced by ether, and coagulation is effected by corrosive sublimate, sulphate of copper, and other inorganic compounds.

The yolk consists of water, an albuminous body called *vitellin*, the integumentary matter of the yolk corpuscles, palmitin, olein, cholesterin, protagon, lecithin, phosphoglyceric acid, glucose, a starch-like substance, yellow and red colouring matter, alkaline chlorides and sulphates, alkaline and alkaline earthy phosphates, oxide of iron and silicic acid. When boiled it solidifies to a crumbling yellow mass. It is coagulated by alcohol, which also extracts from it the colouring matter. By repeated treatment with ether the fats and colouring matter, and some other constituents are removed, and the colourless residue contains albuminous matter. The colouring matter is of two kinds, yellow and red. Both are soluble in alcohol, but not in ether unless the fats are present. The red contains iron. The yellow colouring matter, from its behaviour with certain reagents, has been thought to bear some analogy to hæmatoidin, which is found in the corpus luteum of the cow. Nothing is known of its composition.

The eggs of some reptiles, fishes, and insects have

been examined. These differ both in structure and in composition from the preceding; they do not contain any portion corresponding to the white; and though the yoke contains albumin, fat, lecithin, and most of the constituents above-mentioned, yet they are present in different proportions, giving the yolk quite different characters, while the albumin has generally some peculiarity in the eggs of the different species. From fishes' eggs, moreover, certain peculiar bodies called *ichthin*, *ichthidin*, and *ichthulin* have been extracted, which differ in different species, while from the egg of the tortoise a white hard granular body *emydin* has been got. All these belong to the same class as vitellin. The eggs of frogs contain a black colouring matter, and those of crabs a colouring matter which turns red, and is similar to that contained in the shell.

Knowledge with respect to this subject is at present extremely imperfect. It belongs to the most difficult department of chemistry, and deals with bodies about which it is uncertain whether they are single, or more or less complex aggregates of dissimilar single bodies. Still less of course is known of the functions these different constituents discharge, or of the chemical changes they undergo in the development of the animal. The results are so uncertain that it is even a question whether the loss of weight in an incubated egg is due to the process and growth of the germ, or merely to evaporation.

EGGA, a town of West Africa, Guinea, in the Yarriba country, on the right bank of the Niger. It is about 2 miles long, and consists of clay houses of a conical form, some of them beautifully smooth and stained with indigo, but without windows, and so closely packed together in narrow lanes that two persons can scarcely walk abreast. The inhabitants, numbering about 7000 to 8000, are half Mohammedans, half pagans, dress neatly, and manufacture large quantities of a narrow cloth, not above 3 inches broad, and generally dyed blue.

EGG-PLANT (*Solanum melongena*, natural order Solanaceæ, an herbaceous plant, from 1 foot to 18 inches high, and more or less covered with pubescence; the flowers are large, white, or purplish; the fruit is large, smooth, and shining, and generally of a violet colour, but sometimes yellow or white. It is a native of the East Indies, and is cultivated in Europe. The fruit is much used as an article of food when cooked, which is done in various ways. *S. Sodomeum*, Sodom egg-plant, or apple of Sodom, is a native of the north of Africa and south of Europe; the fruit is white, and of the size of a walnut. *S. sanctum* is the Palestine egg-plant, and is a native of that country. There are several other species of Solanum, which, on account of the size, form, and colour of their fruits are called egg-plants, as *S. Indicum*, &c.

EGIL SKALLAGRIM, an Icelandic bard or poet of the tenth century, who distinguished himself by his warlike exploits in predatory invasions of Scotland and Northumberland. Having killed in combat the son of Erik Blodox, king of Norway, he was doomed to death on being subsequently taken prisoner by that prince. Egil demanded permission to redeem his life by giving a specimen of his powers as an improvisatore. This was granted, and he immediately composed and recited a poem in praise of Erik, entitled Egil's Ransom, which procured him his life and liberty. This piece is still extant, and a Latin version of it was published by Olaus Wormius, in his Literatura Danica Antiquissima, from which Dr. Percy translated it into English, and printed it in his Northern Antiquities.

EGINA. See ÆGINA.

EGINHARD (EINARD), born in the Odenwalden, about 771, studied at Aix-la-Chapelle, under Alcuin and the other learned men whom the Emperor Charlemagne had drawn to his capital. His talents and learning gained him the love and confidence of Charlemagne, who made him his private secretary, chaplain, and general superintendent of the imperial buildings. It is a common story, the truth of which, however, is much doubted, that Emma, the emperor's daughter, fell in love with the handsome young scholar, and once admitted him to a nightly interview in her own room; the snow fell during the night, and Emma carried her lover from the castle on her shoulders, to save him from detection; the emperor, who had risen early, saw them from the window, and instead of punishing, united them in marriage. On the death of the emperor, Eginhard left his wife, entered the order of Benedictine monks, and became first abbot of the monastery at Seligenstadt, in Darmstadt, where he died in 844. Eginhard is the oldest German historian; and we have from him a full and well written history of the life of Charlemagne (Vita Caroli Magni), among the best editions of which is that of Ideler (Hamb. 1839, two vols.) He wrote also Annals of the Franks, from 741 to 829. His letters, which are of much importance as contributions to the history of his age, are still extant, and have been published. Among the best modern editions of his works are those of Teulet (Paris, 1840–43, two vols. 8vo), and Pertz, in the Monumenta Germaniæ Historica.

EGLANTINE, one of the names of the sweetbrier (*Rosa rubiginosa*); but there is a good deal of confusion in its application, and it is often given indiscriminately to other species of rose.

EGMONT, LAMORAL, COUNT, was born in 1522, of an illustrious family of Holland. He entered the military service, and gained a high reputation under Charles V., whom he accompanied to Africa in 1544. He distinguished himself as general of cavalry, under Philip II., in the battles of St. Quentin (1557) and Gravelines (1558). Philip having gone to Spain, Egmont took part in the troubles in the Low Countries; he endeavoured, however, to adjust the difficulties between the Duchess of Parma, who governed the provinces, and the nobles confederated against her. He even swore, in the presence of this princess, to support the Roman Catholic faith, to punish the sacrilegious, and to extirpate heretics. Still his connection with the Prince of Orange and his most distinguished adherents, made him an object of suspicion to the court of Aranjuez, and Egmont, with the noble Philip of Montmorency, Count Horn, became the victims of hate and fanaticism. The Duke of Alva, who was sent by Philip II. to the Netherlands, to reduce the insurgents, ordered them both to be executed at Brussels, June 5, 1563. Egmont was then in the forty-sixth year of his age. He died with heroic firmness. The French ambassador announced the event to his court with these words: 'I have seen that head fall which twice made France tremble.' Egmont had before written to Philip II., that 'he had never joined in any undertaking against the Catholic religion, nor violated his duties as a loyal subject.' But the Prince of Orange having taken the field as the champion of his country's wrongs, an example was thought necessary to strike terror into the insurgents. Philip II. expressed himself thus on the subject: 'He had caused those two heads to fall, because a pair of such salmon heads was worth more than many thousand frogs.' There can be little doubt but that the Spanish king unnecessarily dreaded the influence of the gallant soldier, but incapable politician. When the troubles in the Netherlands broke out, Egmont, moved by generous sympathy for his injured countrymen, rather than by

any fixed principle of action, was found side by side with the Prince of Orange, in the van of the malcontents. But in opposition to the popular movement came his strong feeling of loyalty to Spain, and his still stronger devotion to the Roman Catholic faith. Thus the opposite forces by which he was impelled neutralized each other, and ever acting from impulse he did not calculate the consequences of his conduct. When these consequences came he was not prepared to meet them.—A well-known drama of Goethe, called Egmont, is founded on the above catastrophe.

EGRA. See EGER.

EGRET, a name given to those species of white herons which have the feathers of the lower part of the back elongated and their webs disunited, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of common herons. The American egret (*Ardea egretta*) is about 37 inches long to the end of the tail, 49 to the end of the claws, with an alar extent of 55 inches. The bill, about 4½ inches long, is straight, tapering to an acute tip, and is of a bright yellow colour. The plumage is soft and blended; head not crested, though its feathers are elongated, as are those of the lower neck in front; from between the shoulders arises a tuft of long decurved and delicate disunited feathers, extending about 10 inches beyond the tail; the wings are moderate, and the tail short, of twelve weak feathers. The feet and claws are black, the plumage white, the train sometimes of a creamy colour. The bird is found breeding from Florida to New York, and along the shores of the Mexican Gulf to Texas. Its food consists of the smaller Mammalia, small fishes, frogs, lizards, snakes, and insects. The long silky filaments of the back are hardly to be seen, except about the love season, which varies from early spring to midsummer according to climate; both sexes possess this train, and many are shot to obtain those feathers for ornamental purposes. The European egret (*A. alba*) is about 40 inches long, of a pure white plumage; the bill is black or dark brown, yellow at the base and about the nostrils, and the legs are almost black. It is common in southern Europe, but comparatively rare in the northern and central parts. The little egret (*A. garzetta*) is about 22 inches long from bill to end of tail, the plumage is white; from the hinder part of the head spring two narrow feathers 4 inches long. This species is confined to the eastern hemisphere, being most abundant in southern Europe and northern Africa; it occasionally wanders as far as England.

EGYPT (Greek, *Aiguptos;* Hebrew, *Misr* or *Misraim*, from the son of Ham; in the language of the country in hieroglyphics, *Chem* or *Chemi*—which signifies the *black land;* and by the Arabs of the present day called *Misr*), a country in the north-eastern part of Africa, forming a semi-independent portion of the Turkish dominions, governed by a ruler who pays tribute to the sultan. It is bounded on the N. by the Mediterranean Sea, on the E. by the Isthmus of Suez and the Red Sea, on the S. by Nubia, and on the W. by the Libyan Desert. The Viceroy or Khedive of Egypt rules over a much larger extent of country than this, however, his dominions including Nubia, and the countries on the Nile up to within a few degrees of the equator. The greatest breadth of Egypt is about 250 miles, comprehending the Greater Oasis, the Lesser Oasis, and the Oasis of Ammon; but inhabited Egypt is confined to the valley of the Nile, which in the widest part does not exceed 80 miles, while for its general length the width is only from 10 to 15 miles, decreasing at the southern boundary to 2 miles. Throughout the entire length of the country run two ranges of lofty mountains, the Arabian Hills on the east, and the Libyan on the west, and through the centre of the valley thus formed runs the Nile, called in the translation of the Bible the great river of Egypt, for the name does not appear, though it occurs in the original text. The Nile enters Egypt at Assouan (Syene), where the last cataracts are, and from this point flows northward through Upper Egypt, until it reaches lat. 30° 15′, where it divides into two main streams, the Bolbitic (now the Rosetta) mouth to the west; and the Phatnitic (now the Damietta) mouth to the east. These two streams, conjoined with a third springing a little higher up, inclose that portion of land known as the Delta, from its resemblance to the Greek letter Δ, and which owes its existence to the deposits of alluvial matter brought down by the stream. The Delta is a net-work of primary and secondary channels, and is also intersected by numerous canals. Seven principal channels or mouths were usually recognized in ancient times, the names of which, going from east to west, were the Pelusiac mouth, the Tanitic, the Mendesian, the Phatnitic, the Sebennytic, the Bolbitic, and the Canopic. The Nile has no tides, but a current at the rate of 2½ or 3 miles an hour constantly running towards the sea, and the stream is always deep enough for navigation. The water is usually of a blue colour, but it becomes a reddish brown during the overflow: it is esteemed highly salubrious. The most remarkable phenomenon connected with the river is its annual regular increase, arising from the periodical rains which fall within the tropics. As rain rarely falls in Egypt, the prosperity of the country entirely depends upon this overflowing of the river, for on the subsiding of the water the land is found to be covered with a brown slimy deposit, which so fertilizes the otherwise barren soil that it produces two crops a year, while beyond the limits of the inundation there is no cultivation whatsoever. The Nile begins to rise in June, and continues to increase until September, overflowing the low lands along its course, the waters being conveyed by canals where natural channels fail. The Delta then looks like an immense marsh interspersed with islands, villages, towns, and plantations, just above the level of the water. The water remains stationary for a few days, when it gradually begins to subside, until about the end of October the land is left dry again. The seed is then sown, and an artificial irrigation is continued in two different ways, viz. by means of the water-wheel, or by the instrument called *e'shadouf*. The first consists of a horizontal wheel turned by one on two oxen, which sets in motion a vertical drum, over which is slung a chaplet of earthen jars, which scoop up the water and bring it to a trough on a level with the drum. Into this trough each jar empties itself in succession, and the water is conducted by an inclined channel into the plantation, which had been previously divided into compartments of 1 or 2 yards square, by raising the mould into walls or ridges of 5 or 6 inches in height. Into these compartments the cultivator forms an entrance for the water, by depressing a little space in the ridge or wall with the sole of his foot; and this overlooking of the channels of irrigation, and adjustment of the openings from one compartment to the other with the foot, is continued till the cultivator is assured by the growth of the plants that each compartment is daily and duly supplied with its proper quantity of water. To this peculiarity in the cultivation of the soil of Egypt, whether for corn or other production, allusion is made in Deut. xi. 10.

The second means of raising water, namely, the shadouf, consists of a leathern bucket slung at one end of a pole, which has a weight at the other, a contrivance by which the cultivator is enabled to scoop up

the water considerably below his feet, and raise it with comparative ease to the mouth of a channel on a level with his breast. The last mode of raising water is depicted on the walls of the ancient tombs of Egypt, and also in the sculptures from Nineveh, by which we learn that the 'hanging gardens,' or those plantations on the artificial mounds of that celebrated city, were irrigated. The land is soon covered with green crops, which last till February, and the harvest is in March. An elevation of the river of 16 cubits, or about 26 feet, is essential to secure the prosperity of the country; and as that elevation subsides, the chaplet of buckets is lengthened or the number of shadoufs is increased. Should the Nile rise above this height it does great damage, and involves the population in distress; while if it should not attain the ordinary height, there is deficiency of crops and famine; but so regular are the operations of nature that, with rare exceptions, the inundations are nearly uniform. The rate of the deposit of mud is supposed to be about 6 inches in a century.

The openings or lateral valleys of the hills confining the valley of the Nile are comparatively few, or, being little frequented, are not well known. Those on the east side, with which we are best acquainted, are the Valley of the Wanderings (of the children of Israel), leading from the neighbourhood of Cairo to the head of the Gulf of Suez, and that through which passes the road from Koptos to Kosseir on the Red Sea. West of the Nile, in lat. 29° 20′ N., a deep sinuosity in the Libyan chain of hills forms the fertile valley of Fayoum (in Coptic, *Ph-iom*, the sea or lake), in the north-west and lowest part of which is the lake named Birket-el-Kerún, the level of which is perhaps not above that of the river. The eastern part of the Fayoum was anciently the site of the celebrated Lake Moeris, the embankments inclosing which were first recognized and traced in 1842, by M. Linant de Bellefonds.

The oases already mentioned extend in a narrow line along the hollow region of the Libyan desert, parallel to the general direction of the valley of the Nile, and above 80 miles west of it. The Great Oasis, called, from its chief town, El Wah el Khárijeh, lies immediately west of the Thebaid, and has a length of 100 miles. About 50 miles west of the northern extremity of this oasis lies the Wah el Dakhileh, 24 miles long and 10 miles broad. West by south from the Fayoum the date groves of the Little Oasis (Oasis parva), or Wah-el-Baharieh, display their unusual verdure. In this fertile spot artesian wells are numerous, and some of ancient construction have been discovered which have a depth exceeding 400 feet. On the road between this oasis and that of El Dakhileh, inclining to the west, occurs half-way the Wah-el-Feráfreh, of small extent. West of Fayoum, and about 200 miles from the Nile, lies the oasis of Siwah, where the foundations of the once-celebrated temple of Jupiter Ammon may still be traced. The inhabitants of this secluded spot, though tributary to Egypt, are in language and manners wholly Libyan. The region of the oases terminates towards the north in the desert of the Natron Lakes. The deserts on the west bank of the Nile generally present to view uniform plains of gravel or of fine drifting sand; on the east the scene is varied by rocks and mountains, but the aridity is extreme, and the heat, reflected from surrounding cliffs, is often insupportable.

As Egypt embraces two widely different regions, namely, the broad plains of the Delta and the comparatively narrow valley of the river higher up, so it naturally falls into two parts or divisions, namely, Upper and Lower Egypt. These were anciently regarded as separate kingdoms, denoted in hieroglyphics by different crowns or royal tiaras. Whenever they were united under the same rule, the Pharaoh bore the title of 'The Lord of the two worlds.' But the lower part of the valley, which includes the Fayoum, differs widely again from the narrower portion higher up; hence the division into Upper, Middle, and Lower Egypt; or, to use the Arab names, Saïd or Marés (in Coptic, the South), Wustaní, and Er Rif. The whole country appears to have been subdivided from the earliest ages into districts, or, as the Greeks termed them, nomes, each with a chief city. Upper Egypt, or the Saïd, was often named by classic writers the Thebais; and Middle Egypt, divided into seven nomes, the Heptanomis. These three divisions are now divided into eleven administrative provinces.

Climate.—The atmosphere in Egypt is extremely clear and dry, the temperature regular and exceedingly hot, though the heat is tempered during the daytime for nine months of the year by the strong wind which blows from the north, and which enables vessels to ascend the river against the stream. The winter months are the most delightful part of the year, the air being cool and balmy, and the ground covered with verdure; later, the ground becomes parched and dry, and in May the suffocating khamseen, or simoom, begins to blow into the valley from the desert plains on each side of it, raising clouds of fine sand, and causing various diseases, until the rising of the river again comes to bless the land. It rains but rarely, except near the sea-shore. At Memphis the rain falls perhaps three or four times in the course of a year, and in Upper Egypt only once or twice, if at all; but at night the dews are heavy and the air cool and refreshing: showers of hail sometimes reach the borders of Egypt, but the formation of ice is very uncommon. Earthquakes are occasionally felt, and thunder and lightning are neither frequent nor violent. Egypt is not remarkably healthy, as in addition to visitations of plague and cholera, ophthalmia, diarrhœa, dysentery, and boils are very prevalent.

Geology and Mineralogy.—The hilly region which separates Egypt from Nubia is composed of granitic rocks, which terminate at Assouan (Syene), and extend up the shore of the Red Sea to near the Gulf of Suez. The Arabian and Libyan hills are both composed of cretaceous strata, the predominant rock being limestone. This sandstone extends from Assouan to Esné, about 85 miles, where it is covered by a limestone of the upper chalk series. From thence for 130 miles the valley is bounded with a tertiary nummulite limestone. Over a great extent of Egypt the rocks are covered with moving sands, and in the lands bordering on the Nile by the alluvium deposited during the inundations, and which consists of an argillaceous earth or loam, more or less mixed with sand. The sedimentary deposit has no traces of stratification. The minerals used in buildings, sculpture, vases, &c., were found in the rock formations of the country. Granite, syenite, and basalt were obtained from Assouan, sandstone from Silsilis, alabaster from Tel-el-Amarna, limestone from Beni-hassan and from Toora, breccia from the Cosseir Rood, porphyry from the quarries of Gebel-Dohan, emeralds from the mines of Gebel-Zabara, gold from the mines in Upper Egypt, iron from the desert plains of Nubia, and natron from the lakes in the Oasis of Ammon, hence called sal-ammoniac. Bitumen, salt, and sulphur are also among the other minerals of Egypt.

Botany.—It would appear that, anciently as now, Egypt did not produce timber; the only trees, besides the palm and tamarisk, being the sycamore, fig, and acacia or gum-arabic tree, which last does not attain to any size north of Wady Halfa. The papyrus plant, once so important, is now nowhere to be found in the country. Of it was manufactured a paper, which was

supplied to all the ancient world. Boats, baskets, cords, and shoes were also made of it. The disappearance of this important plant seems to have been prophetically announced in Isaiah xix. 7. Besides the lotus or water-lily of the Nile, Egypt has always been celebrated for its production of corn, barley, a great variety of the bean class, leeks, garlic, onions, flax, and for plants of the cucumber tribe, as we learn from the sculptures and from several passages in Holy Writ, and they are still abundant as ever. To the products of ancient times have been added the sugar-cane, cotton plant, indigo, and tobacco. Wine was abundantly produced in Egypt, and the sculptures bear ample testimony to the extent to which the ancient Egyptians indulged in intoxicating beverages.

Zoology.—Egyptian oxen were celebrated in the ancient world. The camel was introduced by the Ptolemies; horses and asses abounded. The giraffe is found on the southern borders; the hyena, jackal, ichneumon, and jerboa are common; and the hippopotamus and crocodile formerly reached the Delta, but they are now seldom seen below Lycopolis (*E'siout*). Water-fowl were plentiful, and were anciently prepared and salted like the fish of the Nile, as we learn from the sculptures, and must have been a great source of wealth; representations are found of such birds as the ostrich, the vulture, the hawk, the heron, &c. The crocodile, serpents, the asp, and other reptiles are common. The Nile abounds in fish, and the trionyx or soft tortoise is not unfrequent. Among the countless insects are the sacred beetle (*Scarabæus sacer*), the locust, and mosquito. The ibis, formerly so common, is now extinct. Many of the animals, birds, and reptiles were held sacred by the people; whoever killed a sacred animal, an ibis or a hawk, was put to death. If a cat died a natural death every person in the house shaved his eyebrows; if a dog died the whole body and the head were shaved. The cats were buried at Bubastis—the dogs in the vaults of their own cities; field-mice and hawks at Buto; the ibis at Hermopolis, and other animals where they were found lying. Of all animals the sacred calf Apis was the most revered. The chief temple of this god was at Memphis. The females being sacred to Isis were thrown into the Nile, which was considered sacred, and the males were buried at Sakkara, where their tombs have been discovered by M. Mariette.

Industry and Commerce.—The branch of industry for which Egypt is peculiarly adapted by nature is agriculture, and large quantities of cereals are raised and exported; yet in that country, where three successive crops may be gathered in the year, agriculture is still in a very low state, the necessary consequence of the wretched condition and extreme poverty of those engaged in it. The Egyptians still adhere to their ancient custom of uniting the followers of each business or profession into a guild or corporation, governed by their chief or sheikh, who acts, if need be, as their representative. These guilds are exceedingly numerous, as might be expected among a people whose social organization reaches to a remote antiquity. Of all these trades, however, very few can claim especial mention on the score of importance or singularity. Among these few we must place the business of the *mahm-al-farújy*, or egg-hatching establishments, above alluded to. A very steady heat (about 104°) is required for the success of this process, yet the keeper of the ovens never uses a thermometer, but is guided wholly by experience and practised sensation. The business of tanning also is one in which the Egyptians succeed perfectly, by a process peculiar to themselves. They make excellent morocco leather, which is goatskin dressed and dyed in a particular manner. The pottery of Egypt also deserves a word of praise, chiefly for the merit of the bardaks or water-jars. Coarse cotton cloths and cloths of mixed cotton and woollen, are largely made in the country; silk is cultivated to some extent; and the cultivation of the sugar-cane has received a great impulse from the present viceroy, who has erected a number of mills at great expense. The commerce of Egypt is large, but consists to a great extent of goods carried in transit, large quantities of silk and other products of India and the East passing through Egypt on their way to Europe. The total value of exports and imports averages about £35,000,000 annually. In 1871 the exports from Egypt to Great Britain amounted to £16,387,424; the imports of British produce into Egypt to £7,038,795. The commerce of Egypt has derived great advantages from the construction of the Suez Canal. In 1871 761,875 tons of shipping passed through the canal, of which 546,453 was British. In 1872 there were more than 700 miles of railway in operation in the country.

Inhabitants.—Of the inhabitants of Egypt those of the peasant class, or Fellahs, as they are called, are undoubtedly indigenous, and may be regarded as descendants of the ancient Egyptians. Having embraced Mohammedanism they are often denominated Arabs, though easily distinguished from the true Arab, who regards the Fellah with contempt. The Copts are the descendants of the ancient Egyptians who embraced and still cling to the Christian religion. Though comparatively few in number, their education and useful talents enable them to hold a respectable position in society. The Fellahs are generally peasants and labourers; the Copts fill the posts of clerks, accountants, &c. With those aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (chiefly Bedouins), Armenians, Berbers, negroes, and a considerable number of Europeans. The Turks form a privileged class or kind of aristocracy, and hold the principal offices under government. The Arabs supply the country with camels, sheep, and horses; the Armenians are generally bankers and jewellers; the Berbers do the porter's work, and the negroes are preferred as domestic servants. The population of Egypt was estimated in 1872 at 5,203,405; of the total territories under the Khedive at 8,000,000.

Government, Revenue, &c.—The government of Egypt being in the hands of the Turks is, as might be expected, an unqualified despotism. Under the first viceroy, the founder of the present dynasty, Mohammed Ali, it became in practice more enlightened, liberal, and humane, but its simple fundamental principles remain unchanged. The viceroy, kedervi, or khedive, is absolute ruler of the country, and virtually independent of Turkey, though he pays the sultan an annual tribute of 150,000 purses, or over £705,000. The administration of the country is carried on by a council of state of four military and four civil dignitaries, appointed by the khedive. By the side of this council there is a ministry divided into the three departments of finance, home and foreign affairs. The revenue is chiefly derived from the land tax, and in 1871–72 was estimated at £7,593,645. The army consists altogether of about 24,000 men. The fleet comprises seven ships of the line, six frigates, nine corvettes, and a number of smaller vessels.

History.—The Egyptians are the earliest people known to us as a nation. When Abraham entered the Delta from Canaan, they had been long enjoying the advantages of a settled government and established laws. They had already built cities, practised agriculture, and parcelled out their valley into farms. They reverenced a landmark as a god, while their neighbours knew of no property but herds and movables. They had invented hieroglyphics, and im-

proved them into syllabic writing, and almost into an alphabet. They had invented records, and wrote their kings' names and actions on the massive temples which they raised. As we have no authentic means of counting the ages during which this civilization was progressing, we shall overlook those years when the gods were said to have reigned on the earth, and the times of Menes, the fabulous founder of the monarchy, and regard history as beginning with the earliest remaining records, namely, the temple at Karnak and the obelisk at Heliopolis, both raised by Osirtisen I. of Thebes; the great pyramids built by Suphis and Sensuphis, kings of Memphis; with the tablets in the copper mines near Sinai, which record the conquest of that country by Suphis, and prove that those mines had been already worked by the Egyptians. Such, then, was the state of Egypt in the time of Abraham, about 1600 or 1700 B.C. The country was divided into several little kingdoms, whose boundaries cannot now be exactly known. In the valley to the south of Silsilis was the Kingdom of Elephantine; next was the Kingdom of Thebes, which perhaps included all the valley to the east of the Nile, for it had a port at Ænum on the Red Sea, and thus traded with Arabia. On the west of the river was the Kingdom of This or Abydos, which had some trade with the Great Oasis and the Kingdom of Heracleopolis. Embracing the western half of the Delta was the Kingdom of Memphis, which in the reign of Suphis had been strong enough to conquer Thebes and the Peninsula of Sinai. In the east of the Delta were the kingdoms of Bubastis and Tanis.

It was in the time of these petty monarchies that the Chaldean and Phœnician herdsmen were moving westward and settling quietly in the Delta, till after a few generations they took possession of some of the cities and levied a tribute from the Egyptians. Their sovereigns, called the Hyksos or shepherd kings, dwelt at Abaris—probably the city afterwards called Heliopolis—and they held their ground in Egypt for about six reigns. The tyranny of the Hyksos led the states of Egypt to unite against them; and Amasis, king of Thebes, making common cause with the kings of the other parts of Egypt, the hateful Phœnicians were defeated and driven from the country probably about 1450 B.C., and 200 years after the reign of Osirtisen I. Women were treated with respect, and the laws and customs seem to have been so favourable to them that their condition in Egypt must have been higher than in any other nation of antiquity. With Amasis and the expulsion of the Hyksos began the reigns of those great Theban kings whose temples, and statues, and obelisks, and tombs have for more than 3000 years made the valley of the Nile a place of interest. The kings of the other parts of Egypt sank to the rank of sovereign priests. Amunothph I. gained Ethiopia by marriage. Thothmosis II. added Memphis to his dominions by his marriage with Queen Nitocris, the builder of the third pyramid. Thothmosis IV. built the temple between the fore paws of the great Sphinx. Amunothph III. set up his two gigantic statues in the plain of Thebes, one of which uttered its musical notes every morning at sunrise. Oimeneptthah I. added to the temples of Thebes and of Abydos. Rameses II. (Sesostris) covered Egypt and Ethiopia, and the coasts of the Red Sea, with his temples, obelisks, and statues. He was successful against the neighbouring Arabs, and marched through Palestine to the shores of the Black Sea. Rameses III. still further adorned Thebes with his architecture. It was at the beginning of this period, before Memphis was united to Thebes, that the Israelites settled in the Delta, and that Joseph, as chief minister of the King of Memphis, changed the laws of Lower Egypt. It was after Thebes and Memphis were united, when Joseph's services had been forgotten, that Moses led his countrymen out of Egypt to escape the tyranny of their masters. The wealth of the Egyptians at this time was proverbial, and the still existing monuments of their magnificence prove the high civilization of the country. The Jewish nation was weak and struggling with difficulties before the reign of David; the history of Greece begins with the Trojan war; but before the reign of David and the Trojan war, the power and glory of Thebes had passed away. Upper Egypt sank under the rising power of the Delta. Theban prosperity had lasted for about 500 years.

B.C. 990.—On the fall of Thebes Shishank of Bubastis, the conqueror of Rehoboam, governed all Egypt, and recorded on the walls of the great Theban temple his victories over the Jews. After his death Egypt was torn to pieces by civil wars, and Zerah, king of Ethiopia, was able to march through the whole length of the land. For a few reigns the kingdom was governed by kings of Tanis. Then the kings of Ethiopia ruled in Thebes, and led the armies of Egypt to aid the Israelites against their Assyrian oppressors. This unsettled state of affairs lasted nearly 300 years, during which, as the prophet Isaiah had foretold, Egyptians fought against Egyptians, every one against his brother and against his neighbour; city against city, and kingdom against kingdom. The city of Sais at length obtained the mastery by the aid of the number of Greeks that had settled there, and of the skill in arms of the Greek mercenaries whom the kings of Sais took into their pay. The kings of Sais were more despotic than the kings of Thebes, but under their rule Egypt again enjoyed a high degree of prosperity. They struggled with the Babylonians for the dominion of Judea—Psammetichus conquered Ethiopia—Necho began the canal from the Nile to the Red Sea. His sailors circumnavigated Africa; he conquered Jerusalem; and when the Chaldees afterwards drove back the Egyptian army the remnant of Judah, with the prophet Jeremiah, retreated into Egypt, to seek a refuge with King Hophra. The colony of Greeks at Naucratis, a little below Sais, now became of importance. The Greek philosophers Thales and Solon visited the country. Hecatæus of Miletus went up as high as Thebes, and Pythagoras dwelt many years among the priests. But Egyptian greatness rested on a weak foundation; jealousy increased between the native soldiers and the Greek mercenaries; the armies had to encounter the powerful and ambitious monarchies of Asia, and, as foretold especially by Ezekiel (ch. xxix. xxx.), were put to the worse. Cyrus reconquered the island of Cyprus, and finally Cambyses overran Egypt and reduced it to the rank of a Persian province, B.C. 523. During 200 years Egypt suffered severely under its Persian rulers, or else from its own struggles for freedom. Cambyses plundered the tombs and temples, broke the statues, and scourged the priests. Darius governed more mildly by native satraps; but after his defeat at Marathon the Egyptians rose and made themselves independent for a brief period. Afterwards, when Bactria rebelled against Artaxerxes, they again rose and made Inarus and Amyrtæus kings. Then for a few years Hellanicus and Herodotus, and other inquiring Greeks, were able to enter the country, and study the customs of this remarkable people. When the Egyptians were again conquered Darius Nothus attempted to alter the religion of the country; but when the civil war broke out between Artaxerxes Mnemon and the younger Cyrus, the Egyptians rebelled a third time against the Persians, and with the help of the Greeks were again an independent monarchy. Plato and Eudoxus then visited the country. The fourth con-

quest by the Persians was the last, and Egypt was governed by a Persian satrap till Persia itself was conquered by Alexander the Great, B.C. 332. When Alexander's army occupied Memphis the numerous Greeks who had settled in Lower Egypt found themselves the ruling class. Egypt became at once a Greek kingdom, and Alexander showed his wisdom in the regulations by which he guarded the prejudices and religion of the Egyptians, who were henceforth to be treated as inferiors, and forbidden to carry arms. He founded Alexandria as the Greek capital. On his death his lieutenant Ptolemy made himself King of Egypt, being the first of a race of monarchs who governed for 300 years, and made it the second chief kingdom in the world, till it sunk under its own luxuries and vices and the rising power of Rome. The Ptolemies founded a large public library and an academy of learned men. Under their patronage Theocritus, Callimachus, Lycophron, and Apollonius Rhodius wrote their poems, Euclid composed his Elements of Geometry, Apollonius of Perga invented conic sections, Hipparchus made a catalogue of the stars, Eratosthenes measured the size of the earth, the Bible was translated into Greek, several of the Apocryphal books were written, Homer was edited, anatomy was studied. Poetry soon sunk under the despotism, and the writers were then content to clothe science in verse. Aratus wrote an astronomical poem, Manetho an astrological poem; Nicander a medical poem, and afterwards Dionysius a geographical poem. Under these Alexandrian kings the native Egyptians still continued building their grand and massive temples, nearly in the style of those built by the Kings of Thebes and Sais. The temples in the island of Philæ, in the Great Oasis, at Latopolis, at Ombos, at Dendera, and at Thebes prove that the Ptolemies had not wholly crushed the zeal and energy of the Egyptians. An Egyptian phalanx had been formed, armed and disciplined like the Greeks. These soldiers rebelled unsuccessfully against Epiphanes, and then Thebes rebelled against Soter II., but was so crushed that it never again held rank among cities. But while the Alexandrians were keeping down the Egyptians, they were themselves sinking under the Romans. Epiphanes asked for Roman help; his two sons appealed to the senate to settle their quarrels and guard the kingdom from Syrian invasion. Alexander II. was placed on the throne by the Romans, and Auletes went to Rome to ask for help against his subjects. Lastly, the beautiful Cleopatra, the disgrace of her country, and the firebrand of the republic, maintained her power by surrendering her person, first to Julius Cæsar and then to Mark Antony. On the defeat of Mark Antony by Augustus, B.C. 30, Egypt became a province of Rome, and was governed by the emperors with jealous suspicion. It was still a Greek state, and Alexandria was the chief seat of Greek learning and science. Its library, which had been burned by Cæsar's soldiers, had been replaced by that from Pergamus. The Egyptians yet continued building temples and covering them with hieroglyphics as of old; but on the spread of Christianity the old superstitions lost their sway, the animals were no longer worshipped, and we find few hieroglyphical inscriptions after the reign of Commodus. Now arose in Alexandria the Christian catechetical school, which produced Clemens and Origen. The sects of Gnostics united astrology and magic with religion. The school of Alexandrian Platonics produced Plotinus and Proclus. Monasteries were built all over Egypt; Christian monks took the place of the pagan hermits, and the Bible was translated into Coptic.

On the division of the great Roman Empire (A.D. 337), in the time of Theodosius, into the Western and Eastern Empires, Egypt became a province of the latter, and sank deeper and deeper in barbarism and weakness. It was the prey of the Saracens, Amru, their general, under the Caliph Omar, taking Alexandria, the capital, by assault. This happened A.D. 640, when Heraclius was the emperor of the East. As a province of the caliphs, it was under the government of the celebrated Abbasides—Harun-al-Raschid and Al-Mamon—and that of the heroic Sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1250), and under these formidable despots the last shadow of former greatness and civilization disappeared. Selim, sultan of the Turks, eventually (1516 to 1517) conquered the last Mameluke sultan, Tumanbai, and Egypt became altogether a Turkish province, governed by a pasha. It has since been the theatre of continual internal wars of the Mameluke beys against the Turkish dominion, which has been several times, especially under Ali Bey (1768), nearly extinguished in this country. In 1772 Ali Bey was betrayed and poisoned, and the authority of the sultan was nominally re-established. Confusion and civil war between the different factions of the Mamelukes continued to prevail until 1798, when the French invasion under Napoleon Bonaparte united their chiefs in self-defence. Their famous cavalry made a gallant resistance to the French, but was forced to give way before the science and tactics of Europe. The Mameluke army was all but annihilated in the battle of the Pyramids. The French conquered the whole of Egypt and held it till 1801, when they were driven out by the British under Abercromby and Hutchinson.

On the expulsion of the French the Ottoman Porte effectually urged its claim to sovereignty, and the young officer commanding the Turkish forces, Mohammed Ali Bey, contrived to shorten the contest by entrapping and treacherously murdering the Mameluke leaders. Such was the act which founded the fortunes of the future pasha. As he consolidated his power in Egypt, the Porte, with sinister intentions probably, commanded him to suppress the Wahabi, a fanatical sect in Arabia, grown formidable by their numbers and audacity. But his energy and perseverence overcame all difficulties. He subdued the Wahabi, and annexed to his dominions all the provinces of Arabia bordering on the Red Sea. On the banks of the Nile his conquests extended to Sennar and Kordofan. At length he broke openly with the Porte, and the Ottoman and Egyptian forces meeting in the plains of Nizib, in Syria, in June, 1839, the latter gained a decisive victory; the result of which was a treaty confirming to Mohammed Ali the vice-royalty of Egypt, as a fief of the Ottoman Empire, hereditary in his family. Mohammed Ali had divested himself of many of the prejudices of his countrymen, and in the administration of his dominions followed European models to a large extent, though the government still remained an unqualified despotism. He commenced his great reformation in 1808 by abolishing the right of private individuals to hold property in land. Thus he became the proprietor of the whole kingdom (houses and gardens excepted), and found himself in a position to carry out his farther schemes. He then divided and subdivided the whole country, the officers of every grade, down to the sheikh el Belid or village chief, being not merely magistrates, but overseers of work and tax-gatherers. The Fellahs received wages, sowed their fields as they were ordered by the government, carried their produce to the government stores, and were paid for it at the government price. Thus Mohammed Ali took into his own hands all the agriculture, as well as all the manufactures of the kingdom. He

aimed at developing the resources of Egypt, but this was solely for the purpose of increasing his financial means and political power; and as to the instruction or well-being of his people in general, nothing could be further from his thoughts. One of the principal works carried out by his direction was the Mahmudieh Canal from the Nile to near Alexandria, the first step towards his plan of restoring the ancient commerce of Alexandria with Arabia and the Indies. It is 47½ miles long, 90 feet wide, and 18 feet deep. Nearly 300,000 men were engaged on it at once. Mohammed Ali died in a state of insanity in 1849, after surviving his son Ibrahim, who died in 1848. He was succeeded by his grandson Abbas, who, dying in 1854, was succeeded by his uncle Said, son of Mohammed. Under his rule the country was prosperous, though the people were heavily taxed. Railways were opened, and the cutting of the Suez Canal commenced. He sent young men to be educated in Europe, and travelled himself, being present at the great exhibition of London in 1862. The present ruler, Ismail Pasha, is the eldest surviving son of Ibrahim, and obtained the government in 1863. He has pursued a more enlightened policy, developing commerce, improving the administration of justice, extending the means of education, and suppressing slavery. His title has been raised from that of 'Vali' or viceroy to 'Kedervi-el-Masr' or King of Egypt, or 'Khedive,' as it is commonly called, and has been made hereditary by direct succession to heirs male, and not to the eldest representative of the family, as is the Turkish law. One of the most important events of his rule has been the completion of the canal through the Isthmus of Suez. The funds for the carrying out of this great undertaking were supplied by a French company, with an original capital of £8,000,000, and the head engineer was M. F. de Lesseps. The total cost was not less than £16,000,000. The length is about 100 miles, and the number of workmen engaged on it varied at times from 15,000 to 40,000. It was opened in November, 1869.

Ancient Civilization.—The civilization and customs of the Egyptians at the time of the erection of the pyramids differed in no important points from those of their descendants. The masonry of the passages in the great pyramid has not been surpassed at any age; while the pile is so accurately placed north and south, that the variation of the compass may be ascertained from the direction of its sides. More than 2000 B.C. the Egyptians had duodecimal as well as decimal numbers; weights and measures adjusted to a pound of 1400 grains. The geographical division of the country; the division of the year into twelve months of thirty days, the year being divided into three periods of four months each—the period of inundation, the period of vegetation, and the period of harvest; their ornaments of gold and silver; their musical instruments—all bear witness to the advances already made by the Egyptians in science and art. With the exception that horses and chariots do not appear, the paintings represent the usual industrial pursuits of after times. The statues of the most ancient times were worked to a fixed canon. Bronze statues cast from moulds and having a core of earth were first made in Egypt and introduced thence into Greece by Rhœsus. Painting in tempera appeared at the same age, but encaustic not till the Greek and Roman periods. Their musical instruments were harps, lyres, guitars, drums, tambourines, clappers, double and single pipes, flutes, cymbals, the sistrum, and a few others of less common occurrence. Their amusements were various, including dancing of almeh, juggling, tumbling, mummery, ball, draughts, dice, mora, single-stick, quarter-staff, wrestling, bull-fights, &c. In mechanical arts, the carpenter, boat-builder, potter, leather-cutter, glass-blower, and others, are frequently represented; and we see the blowpipe, bellows, and siphons; the press, balance, lever; the saw, the adze, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III., 1445 B.C. Gold-beating, damascening, engraving, casting, inlaying, wire-drawing, and other processes, were practised. Tin and zinc, as well as iron and steel, are either proved by discoveries to have been in use, or this is inferred from the monuments. In agriculture, are the plough, hoe, sickle, and other implements. In warfare, shields, cuirasses of quilted leather, helmets, spears, clubs, maces, daggers, bows, battle-axes, pole-axes, hatchets, and falchions; for sieges the testudo, ladders, torches, and lanterns. The processes of growing and preparing flax, and making into thread, string, ropes, and cloth, as well as the looms employed, are all depicted. Mats and baskets were beautifully made, either of the halfeh grass or palm leaves, or of the outer rind of the papyrus plant, the pith of which was used in making paper. Coffins or wooden sarcophagi were chiefly of sycamore, deal, or cedar, covered with stucco and richly painted. The ordinary boats of the Nile were of planks of the acacia, and had two rudders or large oars, and the sail of cloth frequently painted or worked in coloured patterns. Many of the vessels of burden were of great size. The boats made of papyrus were mostly punts for fishing, or for gliding through the canals of the Delta. Implements for painting, ladles, bells, crucibles, and surgical instruments have all been found, and are preserved in various museums. The commerce of the Egyptians with neighbouring nations enriched the country with slaves, cattle, gems, metals, rare animals, and objects of curiosity. The Egyptians expended enormous wealth on the tombs and furniture of the dead, and the paintings acquaint us fully with the ceremonies followed, from the embalming to the final judgment.

Ancient Religion.—The two main principles on which the religion of Egypt was based appear to have been the existence of an omnipotent Being, whose various attributes being deified, formed a series of divinities; and the deification of the sun and moon. Not only was every attribute of the Divinity made into a separate deity, but imaginary gods were invented to assume some office relating either to the duties or future state of mankind. Even the imaginary genii of the nomes, cities, or rivers were worshipped as gods, and each month and day were consecrated to a deity (Herod. ii. 82). Each divinity formed a triad with a wife and sister, and a son. The great triads were composed of the principal divinities, the first two members being frequently of equal rank, and the third subordinate, as in the case of Osiris, Isis, and Horus, or Amun, Maut, and Khonso. Other triads are formed of deities of an inferior class; and occasionally a sort of triad was composed of two deities and the king. While the worship of some of the triads was peculiar to particular places, the worship of others was universal—that of Osiris, Isis, and Horus, for example, having prevailed all over Egypt. The eight great gods of the first order are stated to be Neph, Amun-Re, Pthah, Khem, Sáté, Maut, Bubastis (?), Neith. The most important of those of the second order are Re (the sun), Atmoo, Thoth (the moon), Athor, Amunta, Maudoo, Seb, Netpe, Ranno. The Egyptians believed in an author of evil, who was called *Typhon;* and the antagonism of good and evil is shown by the opposition of the solar gods and the dragon Apophis, and the hostility between Osiris and

Typhon. The Egyptians believed in the transmigration of souls and in the existence of a future state, in which mankind would be rewarded or punished according to their actions while on earth. There is also a distinct allusion to a resuscitation of the body, as we gather from the many representations of the soul returning to animate it, and likewise a curious picture bearing a strong allusion to the resurrection, and the two natures of man, the earthly and the spiritual. Copious details and illustrations of the religion of the Egyptians will be found in Jablonski's Pantheon, Wilkinson's Ancient Egyptians, &c.

Ancient Architecture and Sculptures.—The monuments we have left to us in Egypt are of two periods —those built in the times of the Pharaohs, and those built during the rule of the Greek and Roman kings of the country. Although the temples of the two periods differ considerably in plan and in other particulars, there is yet sound reason for believing that those built under the Greeks and Romans were constructed after designs, as they certainly occupy the sites, of Pharaonic temples still more ancient than any now existing; that they were, in fact, mere restorations of temples built by the earlier Pharaohs.

The leading features of the now existing temples of the time of the Pharaohs are these: First, a gateway or pylon, flanked by two truncated pyramids. These occupy the entire width of the building, and form the entrance to a square court, surrounded by a portico supported by a double or single row of columns. Crossing this court the visitor passes through a second pylon into the inner court, which was likewise surrounded by a portico supported either by columns or by piers, against which were figures of the king. Beyond this second court it would appear the public were not admitted, for the spaces between the front row of columns or piers facing the gateway are occupied by a dwarf wall, which effectually barred entrance excepting at either one or three points where there were gates. This inner court led immediately into the largest chamber of the temple, called the *Hall of Columns*, the roof of which was always supported by columns representing a grove of papyrus. The centre avenue was higher than the rest of the hall, and consisted usually of twelve columns, the capitals being imitated from the full-blown expanded papyrus; while the columns which sustained the lower roof were in the form of a bud of the same plant. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns, imitating the bud of the papyrus, either as a single plant or as several bound together; or else by square piers, or columns with eight, twelve, or sixteen faces. These apartments frequently surrounded a dark chamber—the most sacred in the temple—the holy of holies. Whether the roof of the portico which surrounded the court was supported by piers or columns, the structural arrangements were always precisely the same. There was first the pier or column, ordinarily made of several pieces of stone solidly united by mortar and wooden cramps; then came the architrave or frieze, of one block, stretching from column to column; and lastly, the blocks forming the cornice, concealing the ends of the roof stones which rested upon the architrave. The bulk of the column, in proportion to the weight it had to sustain, was extremely ample; and the pressure being always perpendicular, these ancient structures have come down to us with their roofs sound, while arched buildings of much less antiquity have been entirely ruined by the lateral pressure which that mode of construction exerts on the walls. The Egyptian gate was peculiarly simple, with its undisguised lintel and door-posts, all so vividly reminding us of the memorable night on which so many door-posts and lintels in Egypt were marked with the blood of the passover (Ex. xii. 7). The lintel was always of one stone, and the door-posts also were very frequently of only one block, while each of the three portions had its appropriate decoration. Above the entrance was sculptured the winged globe or protecting divinity of entrances, with the names of the divinities to whom the temple was dedicated, and of the Pharaoh who built it. The door-posts also bore the name and title of the builder. The surface of each architectural feature was engraved with its particular ornament appropriately coloured. In the *cavetto*, or hollow moulding of the cornice it was customary to place the name and titles of the Pharaoh or king, with the other significant decorations peculiar to that member of the entablature. The next member, the *torus* or *bead*, had its special decoration; and the architrave stone was likewise symbolically ornamented with the names of the divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abacus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus, the leaves of the calyx would be yellow and the filaments green. Beneath were five horizontal divisions, which probably represented the blue and white bands with which the columns of the primitive temples were adorned on festive occasions. To these succeeded a representation of the king offering gifts to the gods of the temple; and lastly, the yellow and red lines at the base of the shaft signified the brown leaves that envelope the base of the stalk of the natural plant. A further intimation of the origin of this order of Egyptian column is the presence of three ridges extending up the shaft to the bands of the neck of the capital, by which the triangular form of the stalk of the plant was intended to be signified.

The temples built during the reigns of the Greek and Roman kings may be thus described. First, the propylon, with its truncated pyramidal towers, which were sometimes adorned with narrow flags on tall poles; then a court surrounded on three sides with a colonnade. At the extremity of the court, and facing the gateway, was an elevated portico of six columns in line, and three or four deep. The uninitiated obviously were not permitted to enter beyond the court, for the columns of the first row of the portico are invariably joined by a dwarf wall, the only opening being between the centre intercolumniation, to which were attached the valves of the gate. To the portico succeeded a series of small chambers, the roofs of which were supported by four or by two columns. The centre chambers were lighted by small square openings in the roof, and those at the side by small openings in the walls; but in no example is there that kind of clere-story perforated with large openings, that occurs in the Hall of Columns of the Pharaonic temples. Besides the foregoing characteristics, there is an elaborate form of capital, representing the papyrus in three stages of growth, in one capital, or sometimes a collection of lotus flowers, or the full-blown papyrus alone; but in no instance do we find the pier with the attached figure, nor the single bud of the papyrus, nor that form of column which represents several buds of the plant joined together. The palm-tree capital, however, belongs to both periods. Another distinguishing feature of the Ptolemaic temples is, that the masonry is even more perfect than that of the time of the Pharaohs, if we except the pyramids and the granite temples of Lower Egypt. The temples of the Roman period are usually inferior in extent to the Ptolemaic buildings; they are also remarkable for a yet more elaborate form of capital, more salient and curvilinear forms

in the sculpture and architectural decorations, and a still more perfect masonry. Granite seems rarely to have been employed for architectural purposes in any part of Egypt excepting the Delta. In the Thebaid it was used chiefly for sculpture, the ordinary building material being the limestone of the district, or the fine sandstone of the quarries of Silsilis.

The most usual kind of mural sculpture, and entirely peculiar to the Egyptians, seems to have been designed to endure to the latest time. The outline of the object intended to be represented is cut into the smooth surface of the wall, while at the same time the minor forms and rotundity are represented within the incised outline. By this contrivance the general outline is the last part to suffer injury, for to obliterate it the whole surface of the wall must first be destroyed. Sometimes the outline is excessively deep, at others the surface of the figures is altogether much lower than the general surface of the wall, and in others the outline is but slightly incised with a corresponding flatness within. The Egyptians rarely practised the true basso-rilievo, but wherever they did so the sculpture is almost invariably in very low relief. The back view of the human figure is never represented in the bass-reliefs excepting in the case of an enemy, and then rarely; the figure is generally represented in profile, and there are but few attempts at delineating the front view of the foot or of the face; however, whether the face be represented in front or side view, a profile eye is never found. The figures of the king in battle-pieces, and of the landed proprietor in domestic scenes, are always on a much larger scale than the other actors in the piece, from whence we may infer that superior size typified persons of sovereign power, men of renown, or of official or domestic importance. In Egyptian sculpture the erect figure in the round invariably has the left leg advanced, as if about to march; another peculiarity of the round figures is that the limbs are never entirely detached from the body of the stone, the portion of the work thus left being always painted white. In addition to the foregoing special characteristics are certain conventionalities of colour worth noting. The Egyptians are represented with red and yellow complexions, red ochre for the men and yellow for the women. The hair of the king is frequently painted blue, but that of ordinary men black. In representing the various nations with whom they had intercourse, they seem to have endeavoured to imitate the complexions peculiar to each. Amun Ra, the chief divinity of Thebes, is always painted blue, and he is further distinguished by two high feathers which he wears in his cap. The inferior divinities are not uncommonly of the complexions of mortals. The sky or heavens are invariably indicated by a strip of blue coming downwards at the lower side of each extremity, and occasionally having upon it a row of five-pointed stars. Water, seas, and rivers are represented by zigzag lines of a blue or green colour. Mountains have a yellow colour, with red spots upon it.

For an account of the hieroglyphics so abundantly employed by the ancient Egyptians, see HIEROGLYPHICS.

EGYPTIAN VULTURE. This bird (*Neophron percnopterus*) frequents both shores of the Mediterranean, but rarely passes farther north. It is a member of the family *Vulturidæ;* the bill is very long and slender, the tail and wings long, the third feather of the latter is the longest. The head, face, and throat are bare, and of a bright yellow; the wings are black, the outer web of the primaries and most of the secondaries washed over with silvery white; the rest of the body is creamy white; the outer half of the beak is black, the basal portion yellow; the irides are crimson. The mature plumage and crimson irides are not attained before the fourth year, and the young bird is brown all over, with brown iris. This bird is the scavenger of Egyptian villages, collecting in numbers where carrion or garbage attracts them: they go in pairs, however, and addict themselves to particular localities, the congregations being only drawn together by abundance at any point of their favourite food. The species above mentioned does not range far south, *N. pileatus*, Burch., being that found in Central and Western Africa.

EHRENBREITSTEIN, an important fortress, on a rock 370 feet high, overhanging the Rhine, opposite Coblentz, with which it communicates by a bridge of boats. It was blockaded by the French in 1798 and 1799, during the negotiations for peace, till at length it was obliged to surrender for want of provisions, January 29, and in 1801 was blown up. In 1802 the dilapidated fortress, the village of Thal-Ehrenbreitstein, and the jurisdiction appertaining to it, were bestowed upon the Prince of Nassau-Weilberg by way of indemnity. They were subsequently ceded to Prussia (1814). The fortress, rebuilt on Montalembert's system, at an expense of 5,000,000 dollars, can accommodate a garrison of 14,000 men, with magazines to contain stores to last an army of 60,000 for a year. A well, communicating with the Rhine, is sunk through the rock, thus removing all fear of the water supply of the garrison being cut off. It is inapproachable on three sides, and is considered one of the finest fortresses in the world.

EICHHORN, JOHANN GOTTFRIED, one of the most eminent literati of Germany, born in 1752 at Dörrenzimmern, in the principality of Hohenlohe-Öhringen, after studying at Göttingen, became rector of the school of Ohrdruff, in the duchy of Gotha, and in 1775 professor of oriental languages in the University of Jena. In 1788 he accepted of a similar appointment in Göttingen, where he became in 1811 Doctor of Divinity, and in 1813 joint-director of the Royal Society of Sciences. He died in 1827. His acquaintance with oriental literature and history was first displayed in a History of the East India Trade before Mohammed (Gotha, 1775). In Göttingen he devoted himself particularly to biblical criticism. The fruits of his labours were his Universal Library of Biblical Literature (ten vols. Leipzig, 1787–1801), forming a supplement to an earlier work published by him and several other learned men under the title of Repertory of Biblical and Oriental Literature (eighteen vols. Leipzig, 1777–86); Introductions to the Old and to the New Testament, and to the Apocryphal Books of the Old Testament, and a Latin Commentary on the Apocalypse. At a later period he occupied himself more especially with ordinary and literary history. His comprehensive work, the History of Literature from its Commencement to the most Recent Times, reached six volumes, but was not completed.

EICHSTÄDT, a town, Bavaria, Middle Franconia, in a deep valley of the Altmühl, here crossed by four bridges, 67 miles N.N.W. of Munich; pop. 7011. It is of Roman origin, was surrounded by walls as early as 908, came into the possession of the Bavarians in 1805, and in 1815 was made the capital of a principality bestowed on Eugene Beauharnais, in whose family it remained till 1854, when it was acquired by the Bavarian government. Its principal edifices are a fine Gothic cathedral, founded in 1259, adorned with beautiful stained glass and several good paintings, and containing some curious monuments; several other handsome churches, an old townhouse with a square tower, a Capuchin monastery, a Benedictine nunnery, a modern castle, and the old castle of Willibald, now used as barracks.

EIDER, a river, Prussia, which rises in Holstein, about 12 miles from Kiel, flows first north-west to the frontiers of Schleswig, then west with many windings, forming the boundary between Schleswig and Holstein, and after a course of 92 miles, of which 69 are navigable, falls into the North Sea at Tönning. By its junction with the Schleswig-Holstein Canal it gives a communication between the North Sea and the Baltic.

EIDER DUCK (*Somateria mollissima*, Linn., Wilson; *Fuligula*, Bon.) This valuable bird is found from 45° north to the highest latitudes yet visited, both in Europe and America. Its favourite haunts are solitary rocky shores and islands. In Greenland and Iceland they occur in great quantities. In particular spots their nests are so abundant that a person can scarcely walk without treading on them. The eider duck is about twice the size of the common duck. Their nests are usually formed of drift grass, dry sea-weed, lined with a large quantity of down, which the female plucks from her own breast. In this soft bed she lays five eggs, which she covers over with a layer of down; then the natives, who watch her operations, take away both the eggs and the down: the duck lays a second time, and again has recourse to the feathers of her body to protect her offspring; even this, with the eggs, is generally taken away; and it is said that in this extremity, her own stock being exhausted, the drake furnishes the third quantity of down; if the robbery should be repeated, however, they abandon the place. One female generally furnishes about ½ lb. of down, but the quantity is reduced by cleaning. This down, from its superior warmth, lightness, and elasticity, is preferred by the luxurious to every other article for beds and coverlets; and, from the great demand for it, those districts in Norway and Iceland where these birds abound are regarded as the most valuable property, and are guarded with the greatest vigilance. Each proprietor endeavours, by every means in his power, to draw those birds from his neighbour's ground to his own, and when they settle in an island off the shore the cattle and herdsmen are removed to allow them to breed undisturbed. Very little of the eider down remains in the countries where it is collected. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 lbs. It is so fine and elastic, that 5 lbs. of the best quality is sufficient for a whole bed. The down from dead birds is little esteemed, having lost its elasticity. The length of this duck is 2 feet 3 inches, extent of the wings 3 feet, weight from 6 to 7 lbs.; the head is large, and the bill of singular structure, being 3 inches in length, forked in a remarkable manner, running high up in the forehead, and having the plumage on each side descending nearly to the nostrils: the whole of the bill is of a dull, yellowish horn colour, somewhat dusky in the middle. The male is black, head and back white, with a black crown. The female is wholly reddish drab, spotted with black, with two white bands across the wings. The young of both sexes are the same, being covered with a kind of hairy down, throat and breast whitish, and a cinereous line from the bill through the eyes to the hind head. These birds associate in flocks, generally in deep water, diving to great depths for shell-fish, which constitute their principal food. They frequently retire to the rocky shores to rest, particularly on the appearance of an approaching storm. Their flesh is eaten, but tastes strongly of fish. The eggs, however, are esteemed. These and the down are both frequently obtained at the hazard of life by people let down by ropes from craggy steeps. The Greenlanders likewise use the skin, taken off, feathers and all, for their under dresses.

EIDOGRAPH (Greek, *eidos*, form, and *grapho*, I write), an instrument invented about 1821 by Professor Wallace of Edinburgh by which copies of drawings are made, reduced, or enlarged in any proportion within certain limits. It is more convenient and accurate than the ordinary pantograph. It is fully described in Wallace's Geometrical Theorems and Analytical Formulæ (1839).

EIG, an island on the west coast of Scotland, county of Inverness, about 10 miles from the mainland, and 5 miles long by about 3 broad. It presents bold, rocky shores, and at its south extremity terminates in a lofty promontory called the Scuir of Eig, with a peak of columnar pitchstone porphyry 1339 feet above the sea, and on one side perpendicular as a wall. In one of the numerous caves found along the coast the M'Donalds, the inhabitants of the island, took refuge from the pursuit of their enemies, the M'Leods of Skye. The latter kindled fires at the mouth of the cave (which is so narrow that it can only be entered by creeping on hands and knees), and suffocated the M'Donalds, whose whitened bones in the cave still attest the truth of the tragedy. The island has a population of 282, chiefly engaged in rearing cattle.

EIKON BASILIKÈ (Greek, the royal image), the name of a book published by Gauden, rector of Brightwell (afterwards bishop of Worcester), shortly after the execution of Charles I. in January 1649, and supposed by some to have been written by the king himself. At the Restoration Gauden publicly laid claim to the authorship, and a memorandum in the copy of the Earl of Anglesea, lord privy-seal under Charles II., contains the following declaration: —The work in question 'was none of the said king's compiling, but made by Dr. Gauden, which I here insert for the undeceiving others in this point, by attesting so much under my hand.' The earl says he had the authority of Charles II. and the Duke of York for this statement. It is nowadays generally believed that the bishop wrote the book, but that the king may have revised it while a prisoner in the hands of the republicans. 48,000 copies were sold within a year of its publication, and the work was universally held to be the king's. The royalists considered it the noblest prose work in the language, and the republicans put forward their noblest literary champion to answer it. The Eikonoklastes of John Milton appeared the same year, by order of Parliament. The Eikon Basilikè professes to be a sort of private journal of the king. It is written in an affectedly dignified strain, which wearies by its monotony and displeases by its artificiality. In it, as in all the productions of deposed monarchs, are found numerous assertions of his love and tender care for his either misguided or ungrateful people.

EILDON HILLS, three picturesque, conical-shaped hills, south of Melrose, Roxburghshire, Scotland. Two of them attain to an elevation of about 1400 feet above sea-level, and on the third are the traces of a regularly formed Roman encampment.

EILENBURG, a town, Prussian Saxony, government and 26 miles N.N.E. of Merseburg, on an island of the Mulde, communicating with the shore by two bridges. It consists of the town proper, inclosed by walls and ditches, and four suburbs, contains a castle and two churches, and has manufactures of calico, &c., a trade in cattle, and four annual fairs. Pop. 10,135.

EIMBECK, or EINBECK, a town of Prussia, in the province of Hanover, on the Ilm, near its junction with the Leine, 40 miles south of Hanover; pop. 6189. It was a place of importance in the fifteenth century, and distinguished itself by its early adherence to the Reformation, but has greatly decayed in recent times. It is in the form of an irregular oval, inclosed by di-

lapidated walls, which were partially destroyed by the French in 1761; and with the exception of one part, which was burned down in 1826, and has been rebuilt in an improved form, consists of narrow, winding, and ill-paved streets. It has an active trade in corn, wool, and flax.

EINSIEDELN, a village and district, Switzerland, in the canton and 9 miles north by east of Schwyz. It stands 3000 feet above the sea, and is celebrated for its Benedictine abbey, which was founded in the tenth century, though the present building, esteemed one of the finest in Switzerland, was only erected in the commencement of last century. An image of the Virgin, alleged to possess miraculous powers, annually attracts immense numbers of pilgrims to the dedication festival, at which, however, in 1517, Zwinglius preached with such effect against pilgrimages, indulgences, and monastic vows that the monks laid aside their cowls, and the abbey was for a time almost deserted. About 150,000 pilgrims, chiefly Alsatians, Swabians, and Swiss, visit the place yearly. There is a valuable library, consisting of 26,000 volumes and numerous manuscripts, in connection with the abbey. Pop. 7633.

EISENACH (anciently *Isenacum*), a town of Germany, in the grand-duchy of Saxe-Weimar, at the junction of the Nette and Hörsel, formerly capital of a principality of the same name. It is a well-built town, and contains two splendid churches, several others of lesser interest, a gymnasium with a library, and has some manufactures, chiefly of coarse woollen. Here J. Sebastian Bach was born in 1682. It is most agreeably situated, near the mountains of Thuringia. Half a league from this town lies the Wartburg (which see). Pop. 18,967.

EISLEBEN, a town, Prussian Saxony, in the government and 25 miles north-west of Merseburg, celebrated as the place where Luther was born, 10th November, 1483, and where he died, 28th February, 1546. It consists of an old and a new town, the former surrounded by walls. In one of the churches of the old town still stands the pulpit in which Luther used to preach. The other buildings of interest are a castle, a gymnasium founded by Luther shortly before his death, and an orphan school, which was built upon the lower story of Luther's house, all that was spared of it by a fire in 1689. Copper is extensively worked in the neighbourhood. Pop. 13,434.

EISTEDDFOD (Welsh, *eistedd*, to sit), the name of an assembly of Welsh bards for the purpose of musical and poetical contests. They were held at different places for the minstrels of their respective neighbourhoods; at Caerwys, at Aberfraw in Anglesea, and at Mathravel in Powys. The judges were appointed by commissions from the native princes, and after the conquest from the English kings. The last was issued in 1568; but the ancient custom has been again revived by the Gwynnedigion and Cambrian Societies, and annual meetings for the recitation of prize poems and performances on the harp are now held under the name of Eisteddfod.

EJECTMENT, in law, is an action by which a person ousted from the possession of an estate for years, in lands or tenements, may recover that possession. But though the action is intended only for the recovery of a term for years (that is, the possession of an estate for an ascertained period), it is, in fact, used in England to try the title to an estate of inheritance, or for life. In the early periods of the English law the tenant or person dispossessed of his estate for years could not recover the possession of it, in this action, in the courts of law; he could only recover damages for the injury sustained by being driven from the possession; but the dispossessor kept possession of the term, just as is the case at present in the action of trover and conversion, in respect to a chattel, in which the owner does not recover the chattel itself, but damages for being deprived of it. But the court of equity, in this case as in many others, led the way in ameliorating the law, and enlarged the remedy, so that the plaintiff might recover the term itself; and the courts of law, following those of equity, as early as Edward IV., adopted the same remedy, and awarded execution for putting the plaintiff into repossession of his estate, though no such thing was warranted by the writ, or prayed for by the declaration.

After taking this step, the next one was to adopt the same form of action for trying the title to the lands. This application of the action of ejectment was made as early as the time of Henry VII. To do this, the person who claimed an estate of inheritance, of which another was in possession, entered upon it, and then made a lease, and the lessee took possession, and remained upon the land in virtue of the lease, until the person claiming under an adverse title put him out; or, if no such person appeared to expel him from the land, he pretended to be driven off by the first person who happened to pass that way, and who was thence called the *casual ejector*, who was, in fact, no ejector at all. Being thus ejected in fact, or by fiction, he brought his action of ejectment, or the party claiming the title brought it in his name, and in this suit the title was necessarily brought into question; for, in order to get possession, he must prove that he had a good and valid lease, which he would endeavour to do by showing that the lessor had the right to make such a lease; that is, that he had the title and right of possession. Besides proving the title of his lessor, he must also prove the lease, his entry under it, and his ouster, or being driven out of possession. When the object was to try the title, the lease, entry, and ouster were a mere ceremony, and might as well be supposed or imagined as actually to take place. The courts accordingly allowed a fiction of the lease, entry, and ouster; the plaintiff stated them to have taken place, though there had, in fact, been no such thing, nor was there any such person as the one named as being the lessee, who, in England, long was John Doe. Thus the action of Doe *ex dem.* [*demisso*] Johnson, against Sampson, means the action of Doe, the lessee of Johnson, against Sampson. If the nominal plaintiff, Doe, had been liable to be called upon to show himself to the court, there would have been an end of the suit, as there was no such person to be found.

Formerly the defendant also, the casual ejector, as well as the plaintiff, was a man of straw, or little better; for he was frequently a person who accidentally came in sight at the time of making the lease, if there was any in fact made, and who would not be disposed to trouble himself to prevent the demandant from getting possession of land in which he himself had no interest or concern; or he might be a friend of the demandant, who had come upon the land at his request to act as ejector, and would be very willing that the demandant should recover it. The tenant, therefore, who was in actual possession of the estate, unless his right was defended by some other person than the indifferent defendant whose name appeared on the docket of the court, was likely to lose his inheritance. To prevent this the court allowed him to appear and defend himself against the claim; and the court always required that notice should be served upon him, to give him an opportunity to appear. But before the court permitted him to appear for this purpose, they required him to admit all these fictions of a lease to John Doe, his entry and ouster, which he was will-

ing to do rather than lose his land. These being admitted by him, he might then proceed to defend the action, and try the question whether he had a better right to continue in possession than this supposed John Doe had to recover the possession upon his supposed lease. The titles of the demandant and tenant were thus brought into comparison, and decided upon. This form of fictitious action has been abolished by what is called the Common Law Procedure Act, 15 and 16 Vict. cap. lxxvi., and a series of simple rules substituted for it. The effect of judgment for the plaintiff in ejectment is that he recovers the possession of the land claimed, with or without costs, but not any particular estate or interest therein. As a general rule, therefore, a judgment in ejectment does not conclude the title; and an unsuccessful claimant can bring another action of ejectment. The action commences by a simple writ, addressed to the tenant in possession, and to all persons entitled to defend the possession, setting forth that the plaintiff has asserted a claim to the land, and calling upon those interested to appear within a certain time to defend their right. The writ contains a notice that in default of appearance the tenant in possession will be ejected.

EKATERINBURG, or IEKATERINBURG, a town, Russia, in the government and 170 miles S.E. of Perm, on the E. side, and in the mining district of the Ural Mountains. It was founded in 1723 by Peter the Great. It consists of two distinct parts, on opposite sides of the Isset, communicating by a handsome bridge. The houses are of wood or stone, arranged in spacious and well-formed streets. It has a mint, arsenal, custom-house, mining-school, hospital, and botanic garden. The art of cutting, polishing, and engraving gems, which are found in the neighbouring mountains, is here carried to great perfection, and, together with mining and metallurgy, and a commerce in cattle and cutlery, forms the chief occupation of the inhabitants. Pop. 24,508.

EKATERINODAR, or IEKATERINODAR, a town, Russia, capital of the territory of Kuban, on the left bank of the Kuban, 150 miles W. of Stavropol. It consists of broad and regular but unpaved miry streets, and occupies the centre of a morass, which, from the difficulty of crossing it, may be considered a mud defence. Formerly capital of the nearly independent state of the Black Sea Cossacks, it took its present name when enlarged by Catharine II. in 1792. Pop. 8753.

EKATERINOSLAV, or IEKATERINOSLAV, a town, Russia, capital of a government of the same name, on the right bank of the Dnieper, 250 miles N.E. of Odessa. It was founded in 1787 by Prince Potemkin. It consists of a number of long and broad streets, only partially built, and extremely dirty; is the see of an archbishop, and the seat of several important public offices and schools, has a large annual wool fair, and manufactures cloth for the army. Pop. 22,548.—The government, constituted in 1784 by Catharine II., is bounded N. by Pultowa and Kharkov, E. by the Don Cossacks, S. by Taurida and the Sea of Azof, and W. by Kherson; has an area of 26,141 square miles, and a population of 1,281,482. The east portion, belonging to the steppes of South Russia, is a monotonous flat, generally without trees, and by no means fertile; the west portion is more undulating, and raises considerable quantities of grain, hemp, and flax. For administrative purposes, the government is divided into seven districts or circles.

EKEBERG, ANDERS GUSTAF, the son of a Swedish naval captain, was born at Stockholm, January 16, 1767, was educated at Calmar, and from 1784 at Upsala, where he graduated, 1788. Thereafter he spent some time in Berlin, and having devoted himself to chemistry, was appointed assistant at Upsala in 1794. In 1797 he published an investigation upon the black mineral from Ytterby, in which Gadolin had found a peculiar earth. In it he confirmed Gadolin's results, and named the earth *yttria*. In a continuation of the subject, published in 1802, he showed that the yttria was mixed with some glucina, and made the discovery for which he is most distinguished. In his examination of other Swedish minerals for yttria he found a new metal which he called *tantalum*, 'partly to comply with the usage of giving mythological names to new elements, partly to indicate its inability, even when in excess of acid, to attract any of it to itself, and to be saturated therewith.' Subsequently it was attempted to identify tantalum with columbium discovered by Hatchett in 1801, but it has been clearly shown that they are different. (See COLUMBIUM.) The rest of Ekeberg's researches are also upon minerals. He was a member of the Upsala and Stockholm Academies of Science. He died at Upsala, February 11, 1813.

EL, or AL, the only article of the Arabian language. It is contained in many geographical names; for instance, *Aldjezair* (Algiers), the islands; *El-Arisch*, the cradle. This syllable has remained in many names of places in Spain and Portugal, as *Alcantara*, the bridge; *Alcazar*, the palace; *Algarve*, the west.

ELAIN, Chevreul's name for the oily principle of fat obtained by submitting fat to the action of boiling alcohol, allowing the stearin to crystallize, and then evaporating the alcoholic solution; or by the simple process of pressing any oily or fatty substance between folds of bibulous paper, the oily matter or elain is absorbed, while the stearin remains. The paper being then soaked in water and pressed, yields up the elain. It possesses much the appearance and properties of vegetable oil, is liquid at the temperature of 60° Fahr., and has an odour derived from the solid fats from which it has been extracted. It is readily soluble in alcohol, and forms soaps with alkalies; in doing which, however, it undergoes decomposition, the oleic acid which it contains combining with the alkali employed. The acid is obtained by submitting the soap formed by the action of potash on hog's lard to the action of boiling water; the solution, on cooling, deposits the margarate of potassium, while the oleate of potassium remains in solution. The oleate of potassium is decomposed by tartaric acid, again combined with potash, and again decomposed by tartaric acid, when the oleic acid rises to the top in the condition of an oily-like fluid. It is insoluble in water, soluble in alcohol, reddens litmus, and combines with the different salifiable bases, forming compounds somewhat analogous to soaps. At a temperature of 35° Fahr. it congeals into crystalline needles. See OLEIN.

ELASTIC BITUMEN, ELATERITE, or MINERAL CAOUTCHOUC. This substance was first described by Dr. Martin Lister, in 1673, from a specimen which had been given him by a Mr. Jessop, who called it a *subterrancan fungus*. It was got in a rocky limestone ground, on a common, 2 miles from Castleton, in the Peak of Derbyshire, in a closed-up mine called the *Old Man*. He says it had no definite shape, was turf-like, of a dark colour, with a fracture like aloes, and when distilled it gave off first an acidulous limpid water, then a white liquor consisting of water mixed with a little oil, and then a yellow oil like that from amber, but no volatile salt. He was in great doubt as to what it was or whence it came. He remarks that there is no coal-bed near from which the bituminous matter might have come, but suggests that it may be either a fungus into which the miners' wooden props had been converted, or a fungus grow-

ing from them; but whether this or a 'mineral juice,' and true fossil bitumen, he does not attempt to decide. The substance was afterwards examined by several chemists, who make it probable that it is a hydrocarbon, but containing some oxygenated body. It is a black substance, usually dead and lustreless externally, but when broken across it has a peculiar dark-green colour, yellowish where thin, and reddish translucent, with a resinous lustre not unlike aloes, as Lister says, sometimes soft, flexible, and elastic, at other times tolerably hard and rigid, with a very peculiar smell. It burns readily with a bright light, smoky flame, and bituminous odour. It is able to efface pencil-marks. It has been found at other places besides the locality above-mentioned—at St. Bernard's Well, Edinburgh, in France, Zante, and at Neufchatel.

Hatchett, in 1802, described it elaborately, and says it was first noticed in 1786; he does not seem to have been aware of the much earlier account by Lister. Lister's account is remarkably accurate.

ELASTICITY is the property in virtue of which bodies resist change of volume and change of shape, and in virtue of which they return to their original volumes and shapes when compressing and distorting stresses are removed from them. The former is called elasticity of volume, the latter elasticity of shape. The name *Compressibility* is also used in connection with the elasticity of volume; and *Rigidity*, or resistance to change of shape, in connection with the latter. Fluids possess no rigidity whatever; they offer no *permanent* resistance to change of shape; a fluid takes perfectly the form of the vessel in which it is put, or of any body immersed in it. A solid body, on the other hand, unless it is distorted beyond certain limits, called the *limits of elasticity*, tends to return to its original form, and does so when the distorting stresses are removed. Thus a wire when twisted and let go untwists again, or when stretched or bent and let go it contracts or unbends, except in the case where it is overstrained. Both fluids and solids possess elasticity of volume, and tend to resume their original volume after compression. The elasticity of volume of the former is perfect; whatever compression they have been subjected to, they return precisely to their original volumes *at the same temperature* when the forces of compression are removed: in the case of solids there are limits to their elasticity of volume as well as to their elasticity of form; thus gold may be made permanently denser by hammering.

There is one law of elasticity, the celebrated law of Hooke—*Ut Tensio sic Vis*, which translated into the modern language of elasticity stands—*Strain is proportional to stress*. *Strain*, according to the suggestion of the late Dr. Rankine, is used by scientific writers to denote any kind of distortion whatever, whether of volume or of form, and *stress* denotes the kind of force or pressure required to produce the strain in question. Hooke's law then asserts that whatever be the nature of the distortion the amount of it is proportional to the stress that produces it. This law is only considered as applicable so long as we do not go beyond the limits of elasticity, that is, so long as we do not apply to the body stresses which permanently distort it. Many bodies, such as the metals, and glass as far as form is concerned, and gases, and probably liquids too as far as volume is concerned, conform to this law with great exactness. See also BOYLE'S LAW, MODULUS OF ELASTICITY.

ELASTIN. This is a body closely resembling albumin, except that it is free from sulphur, forming the main substance of the elastic fibre which is a characteristic constituent of certain tissues. It is got by boiling the fibre successively with alcohol, ether, water, strong acetic acid, and dilute potash, and then with dilute hydrochloric and water. The tissue then forms a yellow fibrous brittle mass, quite insoluble in water, but when immersed in it, swelling up and becoming elastic, and insoluble also in alcohol and ether. It is dissolved by potash, with decomposition. How it is produced from albumin, and what changes it undergoes in the body, are quite unknown.

ELATER, the name of a family of coleopterous insects, remarkable for a singular apparatus between the thorax and abdomen, by which they are enabled to throw themselves to a considerable height in the air, when placed on their back. The arrangement by which this is effected is so curious, that we cannot suppose it intended solely for this purpose, and deem it most probable that other and more valuable services are rendered to the insect by it. A spine is produced from the thorax, between the first pair of legs, and enters a socket in the post-pectus or breast. The force and elasticity with which the spine enters its appropriate receptacle, aided by the form of the thorax, produces a jar or concussion sufficient to throw the insect several inches into the air. This peculiarity has gained some of them the names of springing-beetles, click-beetles, and skip-jacks. When alarmed, the elater draws its limbs close to the body, and falling to the earth quite motionless, counterfeits death. Flowers, grass, and decaying wood are the proper habitations of these animals, which are almost always found singly, and not in numbers collected together, as in the case of many other beetles. One species is accused of depredations on the roots of wheat—the *E. striatus* of Fabricius, an inhabitant of Europe. The *Elater noctilucus* of South America possesses luminous properties, which are unlike those of the glow-worm, &c., being seated near the head. Colour dark brown, with an ash-coloured down; thorax on each side with a convex round spot, from which the light is emitted; elytra with lines of impressed punctures. The light emitted by several of these insects, inclosed in a glass vase, is sufficient to read by without much difficulty. As ornaments for the hair and evening dresses of the Spanish ladies, they are said to be in great request; but it is probable that the feeble light which they produce would be entirely eclipsed by the glare of artificial light.

ELATERIN ($C_{20}H_{28}O_4$). If the fruit of the squirting or wild cucumber (*Ecbalium officinarum*, or *Momordica Elaterium*) be cut up, the juice expressed, strained, and allowed to stand, a substance deposits which, when collected on a filter and dried, forms very thin, slightly bent, friable cakes, of a greenish-gray colour, with a bitter, acrid taste, a faint odour, and no reaction on test paper. This is the elaterium of the pharmacopœia, which is employed as a cathartic in dropsical and other affections. If the cakes be exhausted with hot alcohol, the solution evaporated and added to water or to potash, elaterin deposits on cooling, and can be purified by washing and crystallization from alcohol. The quantity obtained from *Elaterium album* has been stated at 15 and at 50 per cent. Elaterin crystallizes in lustrous, colourless, hexagonal tables, insoluble in water, slightly soluble in ether, soluble in alcohol. It fuses about 392° F. It dissolves in strong nitric acid, and is reprecipitated by water; it is also taken up by sulphuric acid, the solution, which is at first yellow, becoming deep red. It is a very violent purgative, and is poisonous, but its action is not constant, probably from difference in the purity of the drug. Ecbalin, elateric acid, and some other bodies, are said to exist in the wild cucumber, but this requires confirmation.

ELBA (anciently, Latin, *Ilva;* Greek, *Aetalia*), a small island in the Mediterranean, in the province of Livorno, Italy, separated from the province of

Pisa by the Strait of Piombino, about 6 miles wide. The island is 18 miles in length, and varies in breadth from about 2½ to 10½ miles. The coast is boldly sinuous, and the island is traversed throughout its length by mountains rising to a height of over 3000 feet. It has been renowned for its mines from a period beyond the reach of history. Being very indifferently cultivated, Elba produces little more than three months' provision of corn for its inhabitants. Excellent wine and fruits are produced. The climate is much milder than that of the adjacent continent. Elba contains two grand ports—Porto-Ferraio and Porto-Longone, both defended by fortifications and garrisons. Iron is abundant, but is only worked to a small extent. It is rich in silver, marble, granite, and salt.

Elba has often changed masters; Etruscans, Carthaginians, and Romans, having become paramount in turn in its earlier days. During the middle ages it belonged to the Pisans; to these succeeded the chiefs of Milan and Piombino. In 1548 the Emperor Charles V. ceded the territory of Porto-Ferrajo to the Grand-duke of Tuscany. In 1596 Philip III. of Spain took and fortified Porto-Longone. Till near the close of the eighteenth century the island was shared between the Neapolitans (who had succeeded to the Spaniards in 1759) and its feudal suzerains, the lords of Piombino. From July, 1796, till April, 1797, it was in possession of the British forces. It was ceded to France, by the Treaty of Amiens, in 1802; but reunited to Tuscany in 1807. The Treaty of Paris in 1814 erected Elba into a sovereignty for Napoleon, who resided in it from May 4, 1814, to February 26, 1815; after his second abdication it reverted to Tuscany, with which it passed to the Kingdom of Italy. Pop. 21,400.

ELBE, The (ancient, *Albis;* Bohemian, *Labe*), a river of Germany, one of the largest in Europe. It rises on the S.W. slopes of the Schneekoppe or Snow-cap, one of the highest mountains of the Riesengebirge, which separates, in part, Bohemia from Silesia, at a height of 4440 feet above sea level; lat. 50° 47′ N.; lon. 15° 40′ E. From this point it flows nearly due S. into Bohemia, through a narrow and wild valley, passing Königgrätz, to lat. 50° 3′ N., about 50 miles, when it turns to the W., and having held on that course to lon. 15° E., about 40 miles, takes a general N.N.W. direction till it falls into the North Sea, in lat. 53° 55′ N.; lon. 8° 55′ E., intersecting Saxony, a considerable portion of Prussia, and in the latter part of its course separating the duchy of Holstein from Hanover, the former being on the right, and the latter on the left. The entire length of the river, including windings, is upwards of 780 miles; direct distance, about 395 miles. The tract of country through which the river passes has been divided into two well-defined basins, namely, the basins of the Upper and Lower Elbe, the former being a plateau surrounded by mountains; and the latter a country entirely of plains, and of twice the extent of the former. The basin of the Upper Elbe, which comprehends nearly the whole of the Kingdom of Bohemia, is a hollow space excavated by the waters of the Elbe and the Moldau, and has the two south sides formed by the Forest of Bohemia (Böhmerwald), and by the mountains of Moravia; the two north sides by the Riesen-gebirge and the Erz-gebirge. This basin, which is for the most part ill cultivated and thinly peopled, possesses vast forests, extensive iron mines, and a celebrated breed of horses. The basin of the Lower Elbe is composed almost entirely of plains and of sands, covered with forests, morasses, and small lakes; but slightly fertile, yet well cultivated, well peopled, and having the advantage of extensive communication. The principal affluents of the Elbe are, on the right, the Iser, Schwarz-Elster, and Havel; on the left, the Alder, Moldau, Eger, Mulda, and Saal. In the lower part of its course, namely, between Harburg on its left bank, and Hamburg and Altona on its right, the river is divided into several arms by five large and seven small islands; these arms, however, unite again in a single channel at Blankenese, about 5 miles below Hamburg. The mean depth of the Elbe is 10 feet, and its average breadth 900 feet, but it widens at some points to upwards of 1000 feet, and at its mouth to 5 or 6 miles. It is navigable for about 470 miles, but its navigation is much impeded by the lowness of its bed, the greater part of its course being only from 150 to 300 feet above sea level. Its estuary at Cuxhaven is also much encumbered with sandbanks. It is well stocked with fish, particularly salmon, eels, and sturgeon. The strategical importance of the Elbe has given it, especially in recent times, a distinguished place in the political history of Europe. The manœuvres of the vast armies of the Napoleonic period necessarily turned upon the assailable and defensible points of the great rivers, as the manœuvres of smaller armies, confined to more restricted territories, does upon the course of the lesser rivers; and the passage of the Elbe, the Danube, and the Rhine, has often formed the turning-point in the strategy of European armies. In 1807 the French formed an army of observation on the Elbe. It was crossed and recrossed by the French and allies during the campaign of 1813. Its navigation was closed against the English by the French from 1803 to 1806. It was declared free by the Congress of Vienna in 1815, which, however, had not power to enforce its decree. The navigation of the Elbe has formed the subject of frequent political conference and negotiation. On 1st July, 1870, the navigation was declared free from Hamburg to Melnik in Bohemia.

ELBERFELD, a town of Prussia, in the government of, and 15 miles E. of Düsseldorf, capital of a circle of same name, in the beautiful valley, and on both sides of the Wupper, inclosed by lofty hills. The older part of the town contains a number of good houses, but, on the whole, is poorly as well as irregularly built; the newer part is handsome. Taken in connection with Barmen, which is properly a continuation of it, it stretches along the valley, forming an almost continuous street of 6 miles. It has no historical or antiquarian importance. Its prosperity has been acquired mostly within the present century, and is due to the cotton manufacture, of which it is the central locality in Rhenish Prussia. The most conspicuous buildings are the town-house, which is adorned with numerous frescoes; a handsome church in the Byzantine style; a museum, a gymnasium, with a library and mathematical and physical cabinet, an exchange, a theatre, and an infirmary. In addition to the cotton manufacture, which, under a variety of forms, is the great staple of the town, linen, woollen, silk, and mixed silk goods, ribbons, and velvet are extensively made, and largely exported. There are also numerous mills for spinning cotton twist, linen yarn, and worsted, and dye-works, celebrated for the richness of their colours. The environs are almost covered with bleachfields. Elberfeld is the seat of a mercantile and other courts, and possesses a chamber of commerce, a harmonic and several other societies. Pop. (1871), 71,394.

ELBEUF, or Elboeuf, a town of France, department Seine Inférieure, 11 miles S.S.W. of Rouen, situated in a beautiful valley on the left bank of the Seine. It is handsomely built, and has eight artesian wells and six public fountains. It has two Gothic churches, St. Stephen's and St. John's. It has spinning-mills, dye-works, and all accessories for the complete production of woollen manufactures,

chiefly of lighter cloths, chequered stuffs, fine coloured flannel fabrics, and all kinds of fancy goods. For these manufactures it is one of the chief centres in France. It is also an entrepôt for the cloths of Louviers and Sedan, which are finer and heavier than those of Elbeuf, and for foreign wools. It communicates by steamers with Paris, Rouen, and Havre. Pop. 21,784.

ELBING, a walled town, West Prussia, on the Elbing, near its entrance into the Frische-Haff, 32 miles E.S.E. of Dantzig. It is divided into the old and new towns, three inner and eleven outer suburbs, is surrounded with turretted walls, with five land and two water gates, and defended by two forts. It has ship-building yards, which do a considerable trade in building and repairing vessels. It is a place of considerable industry, the manufactures including cloth, leather, soap, tobacco, beer, &c. It has a considerable trade, though its importance in this respect was formerly greater. Pop. 31,162.

ELBURZ, or ELBRUZ. See CAUCASUS.

ELCHE (ancient, *Allici*), a town of Spain in the province and 14 miles W.S.W. of Alicante, on the left bank of the Elcha or Vinalapo; pop. 18,734. It is an ancient place, containing various Roman remains; consists in general of wide and well-built streets, and contains among its public edifices a fine church of the Composite order, with a majestic dome, a remarkably fine organ, and numerous statues, pictures, and monuments; a spacious town-house of the fifteenth century, and a feudal castle of the Duke of Arcos. Elche suffered much during both the Peninsular and the Carlist wars.

ELCHINGEN, a village, Bavaria, on the left bank of the Danube, 9 miles north-east of Ulm, which gave the title of duke to Marshal Ney, who here defeated the Austrians, 14th October, 1805. In the neighbourhood are the ruins of a Benedictine Abbey of the same name, founded in 1128. There are two villages, Ober and Unter Elchingen, the former on the same hill with the abbey, the latter to the N.E. of it. The hill on which the abbey stood was occupied by Mack, who had his head-quarters in Ulm; while Ney, on the right bank of the river, repaired the bridge of Elchingen, forced the passage of the river, and took Elchingen by storm.

ELDER, a name given to the different species of the genus *Sambucus*. These are small trees or shrubs, with opposite and pinnated leaves, bearing small white flowers, in large and conspicuous corymbs. The berries are small, and of a black or red colour. The leaves are bitter and nauseous to the taste, and possess purgative and emetic properties. The bark, flowers, and berries are sometimes used in medicine, particularly in cases of dropsy. The wood of the young shoots contains a very large proportion of pith. The species called *Sambucus nigra*, common in England, is a wild shrub, distinguishable by its winged leaves, with serrated and somewhat oval leaflets; its clusters of small white flowers, divided into five principal branches, and the small black berries, by which these are succeeded. Two species inhabit North America—*S. Canadensis*, a common plant from the 49th to the 30th parallel of latitude, and found even among the Rocky Mountains, the berries of which are black, and have a sweet taste; and *S. pubescens*, which bears red berries, and inhabits Canada, the northern parts of New England, and the Alleghany Mountains. The uses of the elder are more numerous than those of most other plants. There is scarcely any part of it which has not been advantageously employed in some way or other. The wood is yellow, and in old trees becomes so hard that it will receive a polish almost as well as box, and indeed is often used as a substitute for box-wood. Its toughness also is such that it is made into skewers for butchers, tops for fishing-rods, and needles for the weaving of nets. It is likewise employed by turners. Sir J. E. Smith has remarked that this tree is, as it were, a whole magazine of physic to rustic practitioners, and that it is not quite neglected even by professional men. Ointments have been made of the green inner bark, and of the leaves. The dried flowers, infused in water, are used in fomentations or as tea, and, mixed with buttermilk, have sometimes been used as a wash for the face. An infusion of the leaves is sometimes sprinkled by gardeners over the buds of such flowers as they wish to preserve from caterpillars. Elder flowers have an agreeable flavour, which they impart in distillation to water; they are likewise used to give a flavour to vinegar. The berries are poisonous to poultry, but their juice, properly fermented, makes a pleasant and wholesome wine; and in Germany a very pure and strong spirit is distilled from them. The juice of elder berries is sometimes employed to give a red colour to raisin or other sweet wine. The young shoots of this shrub are filled with an exceedingly light pith, which is cut into balls for electrical experiments, and is also made into toys for the amusement of children. The elder will thrive in almost any soil and situation; and every part of it has an unpleasant narcotic smell, which ought to render people cautious not to sleep under its shade, since it might possibly prove injurious to them.

ELDERS. We find among almost all nations, in the infancy of civilization, that the oldest men of the tribe, being considered as the most experienced, and the least liable to be influenced by passion, administer justice, discuss the welfare of the people, &c. Many names for the highest officers in various countries convey the idea of old age, as *senator*, which is connected with *senex*, old. With the ancient Jews the *elders* were persons the most considerable for age, wisdom, and experience. Of this sort were the seventy men whom Moses associated with himself in the government. In the modern Presbyterian churches *elders* are officers who, with the pastors or ministers, and deacons, compose the consistories or kirk-sessions, with authority to inspect and regulate matters of religion and discipline. In the first churches of New England the pastors or ministers were called *elders*, or *teaching elders*.

ELDIN, LORD (JOHN CLERK), an eminent Scottish lawyer, was the son of John Clerk of Eldin, Midlothian. He was born in 1757, educated for the law, and admitted an advocate in 1785. In 1823 he was raised to the bench, and took his title from his paternal estate. He died in 1852. Besides his reputation as a lawyer, he was highly distinguished as a wit.

ELDON, JOHN SCOTT, EARL OF, Lord-chancellor of England, was born on 4th June, 1751, at Newcastle-on-Tyne, where his father was a 'fitter,' or coal-merchant, employed in conveying coals in barges, or 'keels,' from the pits to the ports on the Tyne, where they are shipped. He was educated with his brother William (afterwards Lord Stowell) at the grammar-school of Newcastle, and when a boy was noted for rather unruly pranks, such as playing truant, robbing orchards, and the like. On attaining the age of fourteen his father meditated apprenticing him to his own business, in which his brother Henry was already engaged; but the remonstrances of his brother William, who had gained a scholarship at Corpus Christi College, Oxford, and distinguished himself so greatly as to obtain a fellowship, induced Mr. Scott to alter his intentions, and John was accordingly sent in 1766 to University College with the view of studying for the church. In the following year he obtained a fellowship, and

in 1771 won the prize for the English essay. In 1772 he made a runaway marriage with Miss Elizabeth Surtees, daughter of a banker in Newcastle, much to the displeasure of the lady's relations and also of his own, though a reconciliation was ere long effected on both sides. His father settled £2000 on him, and he returned with his wife to Oxford to eke out his income by acting as a private tutor, his father-in-law also shortly afterwards settling £2000 on his wife. The year of grace allowed for retaining a fellowship after marriage expired without his obtaining any ecclesiastical living, and thus abandoning all ideas of continuing in the church he resolved to devote himself to the legal profession, and proceeded to London. He was called to the bar in 1776, and at first entertained the notion of settling in Newcastle as a provincial barrister; but this project was soon abandoned, and he continued to push his way as a lawyer in the metropolis. His progress was at first slow, but having greatly distinguished himself in 1780 by a case which he had to conduct before Lord Thurlow his fame and practice rapidly increased, and in 1782 he was made king's counsel. Next year he entered Parliament as member for the borough of Weobley, and supporting the policy of Pitt was made solicitor-general, and knighted in 1788. In 1792 he purchased the estate of Eldon. In 1793 he became attorney-general, and in that capacity conducted the celebrated prosecutions against Horne Tooke and others for high treason. In 1799 he was created chief-justice of the Court of Common Pleas, and was at the same time raised to the peerage and the House of Lords by the title of Baron Eldon. On the accession of the Addington ministry he became lord-chancellor (1801), and retained it under the subsequent administration of Pitt, whose reinstatement in office he had procured by a series of intrigues which do him little credit. The death of Pitt in 1806 deprived him of the chancellorship; but in the following year, on the demise of the short-lived Grenville cabinet, he resumed it under the premiership of Lord Liverpool. This office he retained for twenty years, and in 1821 was created an earl by George IV. On the accession of the Canning ministry in 1827 he resigned the chancellorship, and never again held office, though he appears to have cherished hopes of doing so till within a few years of his death. He died in London on 3d January, 1838, at the age of eighty-six.

As a lawyer Lord Eldon's abilities are universally acknowledged, and no judge that ever sat on the bench was more thoroughly master of all the details of English jurisprudence, or pronounced more accurate and solid deliverances in civil causes. When we consider his character, however, as a statesman our admiration of him becomes materially lessened, both by his political servility and intrigues, and the intolerance with which he determinedly opposed every species of reform, whether in church or state. By the high Tory party, owing to his unqualified support of existing ecclesiastical institutions, he was denominated 'the pillar of the church;' but a better title for him would have been 'the buttress,' as he never, except while residing in the country, entered a place of worship.

EL DORADO, a fabulous country, in which gold and precious stones are as common as rocks or sand in other countries. Francis Orellana, a companion of Pizarro, first spread the account of this fabulous region in Europe; and an Englishman even published at the end of the sixteenth century a description of this favoured country, with a map. The German *Schlaraffenland*, where roasted pigeons fly into one's mouth, or where, as Goethe has it, the vines are tied by sausages to the stocks, is something similar, as is likewise the French *pays de cocagne*. See COCKNEY.

ELEANOR, queen of Henry II. of England, was the eldest daughter and heiress of William, duke of Guienne or Aquitaine, and born in 1122. In 1137 she married Prince Louis, afterwards Louis VII. of France, and accompanied him on the crusade to the Holy Land, where her alleged gallantries with a young Saracen and others roused the indignation of her husband, and they were divorced by the Council of Beaugenci in 1152. The same year she married Henry Plantagenet, duke of Normandy, who became king of England in 1154, and who thereby became master of her large possessions; but the marriage, as might have been expected, was a very unhappy one. She bore him several sons, and in process of time incited them to rebellion against their father, for which she was committed to prison (1173), and remained in confinement till the death of her husband. On the accession of Richard Cœur-de-Lion, in 1189, she was liberated and named regent of the kingdom during the Crusade. She negotiated a marriage between him and Berengaria of Navarre, whom she accompanied to Messina to join Richard on his way to the Holy Land (1191). She survived the accession of John; and while residing at Mirebeau, in Poitou, was besieged by her grandson, Prince Arthur (1202), in his abortive and fatal attempt to assert his rights against his uncle. She died there 26th June, 1202. Queen Eleanor's jealousy of Henry II., and the story of her treatment of Fair Rosamond, are well known; but the circumstances related of her in connection with the latter affair are, like the history of her alleged victim, entirely legendary. In the writings of the troubadour poets, whose works she patronized, Eleanor is represented in much more flattering colours than by the English and French chroniclers.

ELEATIC, a Grecian philosophical sect, so called because it originated in Elea (Latin, *Velia*), a town of Magna Græcia, of which also three of its most celebrated teachers, Parmenides, Zeno, and Leucippus were natives. The founder of the school was Xenophanes of Colophon, who came to Elea late in life, bringing with him, as Cousin says, the physical theories of the Ionian school, to which he added a metaphysic more conformable to the spirit of his new country. He asserted the unity of God, but he does not appear to have arrived at any settled views as to the mode of explaining the relation of the variety of external nature with the unity to which he attributed its origin. The essence of the Deity, according to him, consists in ruling. He is neither finite nor infinite, moved nor unmoved. His views have been accused of pantheism, but this seems to have arisen only from their uncertainty and want of development in explaining the relation between unity and variety already referred to. That which from the commencement distinguished the Eleatic school from the Ionic was its method, which in the one case was dialectic, in the other empirical. Starting from the observation of external nature, the Ionians endeavoured to discover some elementary principle, as water, air, fire, or a combination of elements, by the action of which the phenomena they observed might be accounted for. The Eleans made the abstract idea of Being or God, deduced from the contemplation of the universe as a whole, their starting-point; and their reasonings sometimes led them to deny the reality of external phenomena altogether. This was the result of the development which the principles of Xenophanes received from his followers Parmenides and Zeno, the latter of whom denied the existence of variety in any form, including that of the world and even of movement.

ELECAMPANE (*Inula helenium*), a plant which belongs to the natural order Compositæ. The stem is 3 or 4 feet high, thick, pubescent, and branching

above; the radical leaves are often 2 feet and more in length; the flowers are large and yellow; the root is perennial, possesses a bitter, aromatic, and somewhat acrimonious taste, and has been celebrated in disorders of the breast and lungs; it is useful to promote expectoration, and is also sudorific.

Two substances have been extracted from the roots. *Inulin*, which is identical with *dahlin*, is got by extracting the roots with water, evaporating the fluid, exhausting the residue with cold water, and washing the inulin which remains. The other, called *helenin*, or elecampane camphor, has been known for upwards of a century. It is extracted from the roots by strong alcohol, filtered hot, three or four volumes of cold water added and allowed to stand, when the helenin deposits. It has little or no taste and odour; can be sublimed; is insoluble in water, but distils with its vapour and dissolves readily in ether and oils. It was formerly prescribed in medicine, but it is not now recognized.

ELECTION (theology). The doctrine, commonly called Calvinistic, that God has from the beginning elected a portion of mankind to eternal life, passing by the remainder. It is founded on the literal sense of certain passages of Scripture, and has been amplified by the labours of systematic theologians into a complete and logical system. It is older than Calvin, and is not exclusively a doctrine of the Reformation, but Calvin has stated it strongly and clearly in his Institutes, and it is generally held as a distinctive doctrine by those who call themselves Calvinists. There are, of course, various ways of defining and explaining the doctrine, and according to the strictness with which it is held, is usually measured the purity of the Calvinism of those who hold it. In this respect it is a test doctrine, and serves to distinguish high from low Calvinists. It is strongly stated in the Westminster Confession of Faith and other standards of the Church of Scotland, and more mildly in the Thirty-nine Articles of the Church of England, Art. xvii.

ELECTION, in politics, is the method of selecting public functionaries in free states. The possession of electoral privileges is not always indeed an infallible index of political liberty. This depends more on the maintenance in a just equilibrium of the different active powers in a state than upon extreme democratic forms of government. Moreover, electoral privileges, whether on a more or less extended scale, cannot be exercised independently and intelligently without a lengthened experience of their working. Hence the instability of many states which have suddenly adopted a widely-extended electoral franchise. Election is not always confined to the selecting of functionaries, though this may be considered, in a state of any extent, the only way in which any real power can be conferred on the people. In France, for example, under both periods of the Napoleonic regime, appeals were made to universal suffrage under the name of *plebiscites* (a hollow imitation under very different circumstances of the Roman *plebiscita*), in which the people were asked to answer specific questions put to them by their rulers. Universal suffrage had already, from want of experience, been abused in France to an extent which had alarmed the people themselves, and advantage was artfully taken of this state of feeling to put questions which admitted of only one answer. No alternative course of action was suggested in the event of a negative answer being returned, and only those who were prepared for an administrative chaos could risk returning such a reply. Moreover, all the returning officers, the maires of towns and préfets of departments, were under the direct control of the government. This leads to the observation that one of the best guarantees for liberty, local self-government, has always been wanting in France; and thus under the Napoleonic regime, notwithstanding the existence of universal suffrage in various forms, the government has always been as nearly as possible a pure despotism, varied in the two periods only by the different characters of the rulers. The two countries in which popular election has been most slowly and carefully developed are Rome and England, the two great fountains of constitutional law in ancient and modern times. To trace the history of elections in either would be to trace the internal history of the country itself. The adoption of universal suffrage in the United States of America goes beyond the example set by the mother country. It cannot be said to have been unattended with evil; and if on the whole it has been more successful in its experience than in that of most European and American states, it must be remembered that the people of the United States, instead of building on an entirely new foundation, have had the experience of the long constitutional history of England to begin with. The chief forms of election in England to which the term *political* may be applied, are parliamentary and municipal elections. There is also an election of peers to represent the peerages of Scotland and Ireland in the House of Lords; and the election of members of school-boards provided for by recent acts of Parliament may be called *semi-political*. The basis of the suffrage in parliamentary and municipal elections is the payment of poor-rates. Members of Parliament formerly required a property qualification in England and Ireland; but this restriction, which never existed in Scotland, has been abolished. In both parliamentary and municipal elections the ballot has been adopted provisionally until 1880. The adoption of the ballot was designed to prevent undue influence being used at elections, for which purpose it had long been advocated. For the prevention of bribery and corrupt practices many acts have been passed, the last of which, 31 and 32 Vic. c. 125 (1868), removes the trial of election petitions from the House of Commons to the Courts of Common Pleas in Westminster and Dublin, and the Court of Session in Scotland. The result of the trial is reported to the Speaker of the House of Commons, who makes a report to the House, which is equivalent to the report of an election committee, and is carried into effect by the House. A member convicted of bribery is disqualified for election, or for voting as an elector, or holding any municipal or judicial office for seven years; electors found guilty of bribery are disqualified for a like period. For school-board elections a peculiar mode of voting has been adopted, for an explanation of which see CUMULATIVE VOTE. See also the article ELECTOR.

ELECTIVE AFFINITY, or ELECTIVE ATTRACTION (German, *Wahlverwandtschaft*). The term affinity, long in use by chemists, originally denoted relationship, community of composition and of properties, which community was supposed to be the cause of the union between bodies: for instance, sulphur and iron. It ultimately came to mean analogy, so that bodies were considered to have affinity in proportion to their chemical similarity. Gradually this meaning was extended and changed, being applied to the tendency of manifestly unlike bodies to combine. Under those circumstances Bergman used the term attraction in preference to affinity. The origin of the idea of election was in the consideration that bodies are held together by some force, and therefore require another force to separate them, coupled with the observation that bodies can displace each other in succession from their compounds, and that a body A, therefore, which can take another, B, from any

third body, C, with which it is combined, and refuse to give it up again, must have the maximum of affinity for the body B. All other compounds, therefore, will be decomposed, but some more easily than others, and by proper arrangement the order of attraction, or the order in which bodies choose one another, can be exhibited. This was done last century by Geoffroy and other chemists, and especially by Bergman, in a series of elaborate tables which displayed a vast amount of labour and ingenuity.

The overturn, however, of the phlogistic system upon which these tables were based, the later establishment of the doctrine of definite proportions, and the discovery by minuter observation that the order of affinity is not invariable under all circumstances, turned away attention from the subject so thoroughly that only a very few chemists have attempted to find a measure of chemical attraction.

Bergman also distinguished between single and double elective attraction, single being exhibited by the displacement of a metal from a salt by another metal, double by the mutual decomposition of two salts. The phrase is not now in common scientific use, but it has been recently revived to express the connection between the chemical activity of a body and its combining weight.

ELECTOR (German, *Kurfürst*, electoral prince), the title of certain members of the first German Empire. The heads of the feudal monarchies of Europe owed their position originally to what may be called a principle of natural selection. The more powerful chiefs or great barons of a district or country chose from among themselves by a sort of necessity the one most fitted by personal qualities as well as by the extent of his possessions to exercise the leadership among them. From this origin of the monarchy two views naturally grew up simultaneously as to the mode of its continuance. The selected chief, looking to the circumstances to which he owed his elevation, did not feel himself indebted to a free choice of the electors, but was led rather to consider his appointment as an acknowledgment of his own superiority. The monarchy consequently became in his estimation a property which he was at liberty to dispose of as he pleased, and his views naturally tended to hereditary succession. The electors, on the other hand, were disposed to regard it as a mere presidency. The powers given to the monarch in their view belonged to themselves, and as they were freely given, might be freely resumed. We find in the early history of the European monarchies these different views continually crossing and blending in the combinations which led to the continuation or change of dynasties. When the sovereign was a man of powerful character, or possessed extensive domains, a preponderating weight was given to the hereditary principle. So strongly indeed was the notion of absolute property associated with the possession of monarchical rank, that it was common for a powerful monarch to divide his possessions among his children. If the heir was a minor, the influence of the ruling family might still suffice to elevate some other of its members to the throne. But the privilege of the feudal lords was held in abeyance, not extinguished, and when a dynasty became enfeebled in means and deficient in great personal qualities, it was frequently asserted either in the formal election of a new head, or in supporting the claim of a more powerful pretender. Thus in France, on the decline of the Carlovingian dynasty, and before its extinction, Eudes, Robert, and Raoul were successively elected in the room of Charles le Gros. It was on the extinction of this same dynasty that the Germans who had submitted to a hereditary monarchy in the family of Charlemagne resumed the right of electing their monarchs. The history of the electorate is somewhat obscure. It had, as in other monarchies, to endure a protracted struggle with the hereditary principle; but while in France, England, and Spain the latter principle early became predominant, in Germany and in Poland, to the misfortune of both countries, the electoral principle prevailed. Arnulf, an illegitimate descendant of Charlemagne, obtained the throne in 888, and was succeeded by his son. From 919 to 1024 the crown was held in direct succession by the house of Saxony, though each monarch was elected in turn. It was at this period that the fiction of the Holy Roman Empire was revived. The house of Franconia followed, and also succeeded for a time in making the empire actually hereditary. The rivalry between this house and that of Saxony, out of which sprang the factions of the Guelphs and Ghibellines, was one of the great causes of the final defeat of their common object. While the struggles of the rival houses were going on, the mode of election itself was likewise undergoing important modifications. The elective power was at first exercised directly by the states of the realm, but from the time of the Franconian emperors the dukes who held the great offices of the crown, together with the three Archbishops of Mentz, Cologne, and Trèves, had enjoyed a privilege called the *jus praetaxandi*, that is, of nominating the prince whose name should be submitted to the States for election. This power gradually, but not without protest, grew into an absolute power of election, and the princes who exercised it took the name of Electors. It was accompanied with a power suggested by the jealousy of their independence which actuated the German princes in making their monarchy elective, that of nominating the terms on which the emperor should hold his office. This was called an election capitulation (*Wahlcapitulation*). (See CAPITULATION.) The number of electors was early fixed at seven. After various changes they were as follows: 1. The Archbishop of Mentz as Arch-chancellor of Germany; 2, the Archbishop of Cologne as Arch-chancellor of Italy; 3, the Archbishop of Trèves as Arch-chancellor of the Kingdom of Arles; 4, the King of Bohemia as grand cup-bearer; 5, the Duke of Bavaria and the Count Palatine as grand-steward, first conjointly, afterwards alternately; 6, the Duke of Saxony as grand-marshal; 7, the Marquis of Brandenburg as grand-chamberlain. The privileges of the electoral body were confirmed by various diets, and especially by that of Metz, in 1356, by which was sanctioned the Golden Bull of Charles IV., the chief provisions of which were that the number of electors should be fixed at seven, after the number of the golden candlesticks of the Apocalypse; that each elector should hold some grand office; that the Duke of Saxony and the Count Palatine should be joint vicars of the empire during vacancies. By this bull Bavaria was excluded from the electorate. The subsequent changes may be briefly noticed.

Frederick V., elector of the Palatinate, on accepting the crown of Bohemia, was declared an outlaw by the empire, and his electoral privilege conferred on Bavaria, in 1623; and when it was attempted, in the Peace of Westphalia (1648), to settle the contests in the empire, an eighth electorate was created and given to the Palatinate. Leopold I., in 1692, made Hanover the ninth electorate, which, after much opposition on the part of the states of the empire and the electoral college, was confirmed in 1705 by the transference to the new elector by Joseph I. of the arch-treasurership of the empire, resigned by the elector palatine, who again took the title of arch-steward. When, in 1777, the house of Bavaria became extinct, and the dukedom fell to the Palatinate, the Bavarian electorship expired likewise, and the

number of electors was again eight; of whom Mentz, Trèves, and Cologne were ecclesiastical and elective by the chapter of their archbishopric; the others secular and hereditary. There were five Catholic and three Protestant electors; Saxony was a Protestant electorate, though the ruling house was Catholic.

By the Peace of Luneville, in 1801, the left bank of the Rhine was ceded to France, and the ecclesiastical electors lost their territory. Several changes took place. In 1802 the Elector of Mentz was declared elector-arch-chancellor, the two other ecclesiastical electors set aside, and Baden, Würtemberg, Hesse-Cassel, and Salzburg declared electorates; so that there then existed ten electors. August 6, 1806, the emperor abdicated the imperial dignity, and the electors gradually adopted other titles. The Elector of Hesse-Cassel fled from his domains, against the advice of Louis Bonaparte, and was declared by Napoleon to have abdicated his authority. When the elector, after the Peace of Paris, in 1814, again took possession of his country, he retained the title of elector, and it was adopted by his successors, until the incorporation of the electorate with Prussia in 1866.

ELECTRA, in fabulous history, daughter of Agamemnon and Clytemnestra. Her step-father, Ægisthus, wished her not to marry any of the princes who were her suitors, lest her children should avenge the death of Agamemnon; he married her, however, to a man of humble rank in Argos, who left her a virgin. At the time of her father's death she saved her brother Orestes; and instigated him to the murder of his mother, for which he was tormented by the furies. When she was informed that he was slain in Tauris by Iphigenia, she was upon the point of putting out the eyes of her sister with a fire-brand, when Orestes came and prevented the deed. Electra afterwards married Pylades, the intimate friend of her brother Orestes. Her story is variously told by the Greek dramatists, Æschylus, Sophocles, and Euripides.

ELECTRICAL FISHES, a name given to fishes that possess the extraordinary property of communicating an electric shock when touched with the hand or an electric conductor. One of the best known of these is the electric eel (*Gymnotus electricus*), which has the body nearly of equal thickness throughout; head and tail obtuse; length, 5 or 6 feet. The seat of the organs which produce this curious effect is along the under side of the tail. They are composed of four bundles of parallel membranaceous laminæ, placed very near each other, and nearly horizontally-extended from the skin to the central medial plane of the body, connected together by numerous vertical laminæ, arranged transversely. The little cells, or rather the small prismatic and transverse canals intercepted by these two kinds of laminæ, are, according to Cuvier, filled with a gelatinous substance; and the whole apparatus is abundantly supplied with nerves. The *Gymnotus electricus*, found in the rivers of South America, is said to possess power, when in full vigour, to knock down a man, and benumb the limb affected, in the most painful manner, for several hours after communicating the shock. By frequent use of this faculty it becomes impaired, and a considerable interval of rest is required to recruit its electrical properties. According to Humboldt the natives of South America make use of horses in taking the Gymnotus. The animals are driven in a body into a stream or pond where the fish abound, and the latter having exhausted their stores of electricity by repeated attacks upon them, are then easily taken. The horses are sometimes so severely stunned by the shocks that they fall and are drowned. Specimens of the *Gymnotus electricus* are reported to attain the length of 6 or 7 feet, but ordinarily they are about 3½ or 4 feet long. The flesh is eatable, and, in appearance and flavour, is said to resemble that of an eel. The torpedo, a species of ray found in the Bay of Biscay and in the Mediterranean, is another electrical fish of great power. There are also the *Malapterurus electricus*, found in the Nile; the *Malapterurus Beninensis*, described by Mr. Murray in the Edinburgh Philosophical Journal in 1855; a species of *Silurus;* and others.

ELECTRIC BATTERY, a collection of Leyden jars so arranged that they may be charged and discharged together. For this purpose all their outside coatings are electrically connected together, and likewise all their interior coatings. The usual arrangement is illustrated in fig. 11, Pl. LI. The jars are arranged in a large wooden box, *a a a a*, which is lined internally with tin-foil; the outside coatings of the jars resting on the tin-foil of the box are thus all connected together. The knobs of the jars are joined together by means of stout brass bars *b b*, and thus all the interior coatings are also in metallic connection. The brass knob and ring shown in front of the box are connected by means of a thick wire or a broad band of tin-foil with the interior lining of the box, and are used for discharging the battery. It is evident that the battery is practically a simple Leyden jar of great dimensions. It is explained under LEYDEN JAR that the quantity of electricity that a jar can receive from any given source depends both on the extent of the coatings and on the thinness of the glass. The arrangement here described is much more convenient than a single jar of enormous dimensions would be. For not only is it difficult to procure a glass jar which would afford such a surface as is easily obtained here, and of the requisite thinness, but also, when powerful charges of electricity are employed, there is always considerable risk of perforation of the jar by means of the electricity breaking through the glass. If such an accident should occur with one of the jars of the battery all the others will be left unhurt, and the one which has been destroyed may be either replaced or removed altogether. Very remarkable effects may be obtained by means of a good battery. It must always be handled with extreme caution, as a shock from such an arrangement is dangerous, and may even prove fatal. The electric battery was first constructed by Winkler, 1746.

ELECTRIC CALAMINE. See ZINC.

ELECTRIC CLOCK, a timepiece in which the motive power is supplied by means of the alternating action of a galvanic current upon the pendulum, in place of the ordinary main-spring and fusee, or weight. A section showing its construction is given in Pl. XXXII. The pendulum-rod C is made of wood, and supported by two thin watch-spring bearings *s s*, insulated from each other at the point of suspension. Attached to the foot of the pendulum, in place of the ordinary bob, is a hollow coil of insulated wire B, shown also in section, in which the convolutions of the wire are indicated by dotted lines. Each end of this coil is carried up the back of the pendulum-rod, and in connection with one of the watch-spring bearings *s s*, passes through the case to the terminal screws *a*, *b*, and thence to the insulated make-and-break piece A, as a means for reversing the current in connection with the motion of the pendulum; *c* and *z* are respectively the copper and zinc poles of the battery, and are brought into contact with the ends of the coil wires *a*, *b*, by the movable connection A, alternating backwards and forwards from the motion of the pendulum, communicated to it by a projecting pin fixed on the back of the rod. The hollow coil B works over two permanent magnets E E′, each

composed of a number of small bar magnets inclosed in a tube, and fixed to the sides of the case, with their north and south poles in opposition. On motion being communicated to the pendulum the current will be reversed at each successive beat, and produce an alternating attractive and repellant influence between the coil B and the magnets E E′, the motive power for maintaining the action of the clock. The battery in general use for these clocks consists of an earthenware jar, containing a solution of common salt in water, over which a copper and zinc plate is supported, and kept at a uniform degree of moisture by the capillary action of cotton-wool; this forms a very constant battery. Sometimes, where the soil is suitable, an earth battery is formed of coke and a copper plate buried in the ground, from which wires are led up to the clock.

Clocks driven by electricity are not in common use, nor can it be expected that they will ever be employed in any but exceptional cases; the pendulum which has just been described has, however, found a most important application, namely, in the *controlling* of clocks by electricity. A clock driven in the ordinary way by spring or by weights, but furnished with one of these pendulums, is kept going as nearly right as possible by ordinary adjustments. The watch-spring bearings *s s* are connected with wires that are led from a standard clock, which is to control the clock in question. By means of a make-and-break arrangement similar to that described above and attached to the standard clock, a momentary current is sent at each beat of the pendulum of the standard clock through the pendulum of the clock to be controlled. The currents are so timed that if the clock to be regulated is losing it receives a slight accelerating impulse at each beat, and if it is gaining it receives a slight retardation. A clock of common construction is thus made to go with as much accuracy as the standard by which it is controlled; and as there may be several clocks in the same circuit, they can all be controlled by the same standard. Usually the standard clock is in an astronomical observatory, which, it need scarcely be remarked, may be at any distance from the clocks it controls. The standard is kept right by comparison with the chief clock of the observatory, and whenever it is in error the error is gradually corrected by the well known method of dropping small shot into a receptacle in the pendulum or removing it as the case may require.

ELECTRIC CONDUCTION. See RESISTANCE (ELECTRIC).

ELECTRIC CURRENT. When electricity is passing through a wire, or through any conductor, solid or liquid, an electric current is said to be flowing through the conductor. For example, we might speak of an electric current flowing from the prime conductor of an electric machine, through a wire connecting the prime conductor and the earth. The term is, however, confined in common language to the currents kept up by a galvanic battery, or by a thermo-electric arrangement, and to *induced* currents. The latter are distinguished by this name from electric currents of the kind just mentioned. See INDUCED CURRENT, INDUCTION COIL, &c.

An electric current passing through a conductor possesses certain properties by which it is recognized; and when it passes through a liquid that is capable of decomposition, a peculiar kind of breaking up of the liquid, termed *electrolysis*, takes place. It gives rise also to peculiar physiological effects. To these we refer briefly and generally here, indicating where particulars on each portion of the subject are to be found throughout this work. With regard to the direction of the current we must remark that this is at present purely a matter for conventional definition. We do not yet know whether it is a positively electrified body or a negatively electrified body that really contains an excess of the electric fluid. The direction of the current is therefore settled by definition, and the flow is considered to take place from a point electrified like glass rubbed with silk to a point electrified like wax rubbed with cat-skin (see ELECTRICITY). Thus if a wire connect the prime conductor of an ordinary electric machine with the earth the electricity is defined to flow from the prime conductor to the earth; and if a plate of zinc and a plate of copper be immersed in dilute sulphuric acid and connected by a wire the current flows, according to the definition above, from the copper through the wire to the zinc, and from the zinc plate through the liquid to the copper plate.

The most important perhaps of all the properties of the electric current is *its power of acting on the magnetized needle*, for it is generally by means of this action that a current is recognized, its direction determined, and its strength measured. When a wire through which a current of electricity is passing is brought near to a magnetized needle the needle tends to take up a position at right angles to the direction of the current. Let such a wire be brought near to a needle supported so as to turn about a vertical axis, as in the ordinary compass; and let it be held above the needle in the direction of the magnetic north and south line. Under the influence of the current the needle will tend to set east and west: but under the action of the earth's magnetic force it tends to set north and south. It will, therefore, under the influence of these two forces, take up an intermediate position, depending on the ratio between the force of the current action and the directive force of the earth. The direction also of the deflection depends on the direction in which the current is flowing. It is on this property of the current that *galvanometers*, that is, instruments for detecting the existence of a current and measuring its strength, depend for their action.

Another property intimately connected with that just mentioned is the *influence of currents on currents*. If two wires have each of them a current flowing through it the wires attract each other if the currents are flowing in similar directions, that is to say, towards the same parts, though perhaps not parallel, and if in dissimilar directions they repel each other. The subject of the action of currents on magnets, and of currents on currents, will be found more fully treated under ELECTRO-DYNAMICS, ELECTRO-MAGNETISM, and MAGNETO-ELECTRICITY. Magneto-electricity is the name given to the part of the subject that treats of the transient electric currents produced by the motion of magnets near to wires or other bodies capable of conducting a current.

A current of electricity passing through a wire meets with resistance, which has been compared to that which water forced through a tube filled with sponge would experience. When the current is caused to pass through a galvanometer the deflections of that instrument indicate the strength of the current, and it is found that when a considerable length of wire is introduced into the circuit the current is diminished. The resistance to the current is greater the greater the length of the wire and the smaller its cross-section. It also varies with the material of the wire, silver and copper wires having least resistance, and wires of iron, lead, and platinum offering very great resistance. (See RESISTANCE—ELECTRIC.) A current passing through a wire which resists its passage gives rise to very considerable heat. Thus a fine platinum wire is heated to redness, whiteness, or even to fusion by the current. The amount of the

heating effect at any part of the circuit depends on the resistance at that part, and is simply proportional to it. (See HEAT OF THE ELECTRIC CURRENT.) The electric light is due to the intense heating of the air and particles of carbon in the short space that separates the carbon points.

The *chemical effects of the electric current* on a compound liquid capable of transmitting it are described in detail under ELECTROLYSIS. Electricity is transmitted across such a liquid in a very remarkable way. As it passes it carries with it a portion of the elements of which the body is composed. Thus when two platinum wires or plates connected with the wires that come from a battery are dipped into a solution of chloride of sodium (common salt), the sodium goes *with* the current (on the supposition mentioned above that electricity flows from the copper or platinum plate of the battery through external conductors to the zinc plate) and the chlorine is left behind. The chloride of sodium is thus broken up, and sodium is set free at one of the platinum plates, and the chlorine is given off at the other. (See also GROTTHÜSS' HYPOTHESIS.) The amount of decomposition that goes on in a given time is proportional to the strength of the current; and if the same current passes through several electrolytes in succession, the quantities of the electrolytes decomposed are proportional to the chemical equivalents of the bodies.

The *physiological effects* of electricity are very remarkable. It was by means of the muscular contractions exhibited by the limbs of the frog under electric excitement that current electricity was discovered by Galvani. The subject has been examined since his time by Faraday, Matteucci, the Becquerels, Dubois Reymond, Dr. Radcliffe, and others, and within the last few weeks (September, 1873) remarkable additions have been made to our knowledge of it, and of the muscular action of animals, by Professor Ferrier. We must refer our readers for a detailed account of the subject to PHYSIOLOGICAL EFFECT OF ELECTRICITY.

The most important *source* of electricity is *chemical action*. When two metallic plates are immersed in a liquid which acts more powerfully on one than on the other—for example, when a plate of zinc and a plate of copper are immersed in dilute sulphuric acid—and are connected by a wire or other conductor, a current is set up between them. Its existence is recognized by the effects mentioned above, by its action on the magnet, and in heating the conducting wire, and by its chemical and physiological effects. Faraday showed, by carefully devised experiments, that the conducting wire is in the same condition under these circumstances as a wire led from the prime conductor of an electric machine to the earth while the machine is being worked.

Another source of electric currents is *heat*. When a complete circuit is formed of two metals, for example, when the ends of a copper wire are soldered to the ends of an iron wire, and when one of the junctions is raised to a higher temperature than the other, a current is set up and maintained so long as the difference of temperature is kept up. Heat disappears while the action is going on, and the current, capable of doing work, by means of an electro-magnetic engine, or of producing chemical effects, in the way of electrolysis, is the result.

Induction is another source of electric currents; but these differ from those already mentioned by their transient nature. The reader will find information concerning them under INDUCTION and INDUCED CURRENTS.

ELECTRIC DISTRIBUTION. See ELECTROSTATICS.

ELECTRIC EGG. See VACUUM TUBES.

ELECTRICITY, the branch of natural philosophy which investigates the attractions and repulsions, the production of light, and the elevation of temperature, as well as the explosions and other phenomena attending the friction of vitreous, resinous, and metallic surfaces, and the heating, cooling, evaporation, and mutual contact of a great number of bodies. Its name is derived from the Greek word *ēlektron* (amber), in which substance its phenomena were first observed. The knowledge which the ancients possessed concerning this interesting and now very extensive branch of science consisted in little more than the fact that amber acquires the power of attracting to itself light bodies on being rubbed, ascribed by Thales of Miletus to an inherent soul or essence, which, awakened by friction, went forth, and brought back the light particles floating around. In the year 1600 Dr. Gilbert, an English physician, published a treatise, *De Magnete*, in which he dealt with the attractions and repulsions due to magnetism and electricity, and remarked that several other bodies besides amber can by friction be made to attract light bodies. The observations of Boyle, Otto von Guericke, Newton, and a few other philosophers of the same period contributed somewhat to the extension of our knowledge of electricity; but it was during the eighteenth century that the most important discoveries and generalizations of the phenomena before known upon this subject were made.

Hawksbee made several very important discoveries, and among other improvements he introduced the glass globe for producing electricity. (See ELECTRIC MACHINE.) Stephen Grey about the year 1729 made numerous experiments with glass tubes and other apparatus, which led to the important discovery that some bodies are conductors and others non-conductors of the electric fluid; and along with his friend W. Wheeler he discovered the method of insulating bodies. M. Du Fay soon afterwards inferred the distinction of vitreous and resinous electricity from having observed the difference of effects arising from exciting a body of a resinous nature compared with bodies of a glassy nature. To the same philosopher is due the merit of introducing the metallic conductor in the electric machine. Von Kleist and Muschenbroek simultaneously discovered the jar or Leyden-phial, and Dr. Franklin or Winkler combined these jars in the form of what is called the electric battery. Franklin, by experimenting on the Leyden jar, was led to the conclusion that while the one side of the jar (when charged) possessed a greater quantity of electricity than its natural share the other side had lost a quantity, and that thus while the one side had electricity in excess the other had it in defect. The distinction which Du Fay had made between vitreous and resinous electricity, regarding them as different fluids, was by Dr. Franklin accounted for on the principle that one class of bodies were surcharged, and therefore gave out electricity, others were undercharged, and were disposed to receive it; the first class he called positive, corresponding to the vitreous class of Du Fay, and the others he termed negative, the same as the resinous of the French philosopher. Dr. Franklin was the first who brought down electricity from the clouds, by means of a kite, and he introduced the conducting-rod for preserving buildings from the action of lightning. The more recent history of electricity is so intimately connected with galvanism that it will be best detailed under that head.

In this article we propose to give a general statement of the fundamental facts of the science, and to indicate where special information on its multitudinous branches may be found throughout this work.

If a dry glass rod be rubbed with a silk handkerchief, or a piece of amber or sealing-wax with a woollen cloth, and be presented to light bodies such

as fragments of paper, thread, cork, light straws, or little bits of gold-leaf, the light bodies are first attracted, but immediately after contact with the glass or sealing-wax they are again repelled. The experiment is better shown by means of a light gilded ball of elder pith suspended by a fine silk fibre. When the glass rod or the sealing-wax is brought near, the little ball is at once seen to be attracted, but on contact with either of them it is immediately driven away from it: and it remains, often for a long time, repulsive of the body that has touched it. It has thus, evidently, received a new power or property by coming in contact with the glass or wax. Let us suppose that the suspended ball has been touched with the glass rod, and has thus become repulsive of it: if we now bring near the sealing-wax, we find that instead of being repelled, it is attracted. The same is true of a ball that has been touched with the sealing-wax, and thus rendered repulsive of it. It is attracted by the glass. Lastly, if a second ball is brought near to the first, which has previously been in contact either with the wax or with the glass, attraction is first exhibited between the two balls, and, after contact, repulsion.

These are the most elementary facts: and even from these alone some very important information is obtained. In the first place, friction of glass with silk, and of sealing-wax with a woollen cloth, confers on these bodies new properties. They become *excited* or *electrified*. They have also the power of communicating their electrification to other bodies, and, again, a body electrified by either of them can electrify a third. There are two kinds of electrification, one, that belonging to glass, which is thence sometimes called *vitreous;* and the other, that of wax, thence termed *resinous*. The last experiment shows that an electrified body communicates to another in contact with it electricity of the *same sort as it possesses itself:* and hence from this experiment, in connection with those that preceded it, we learn *that similarly electrified bodies repel each other, and dissimilarly electrified bodies attract each other*. Finally, we observe that neutral bodies are attracted by those which are electrified.

It was very soon observed that we cannot excite all bodies by friction in the same way as glass, wax, and a number of other substances. Hence bodies were divided by the first cultivators of the science into *electrics*, which can be excited by friction; and *non-electrics*, which cannot be excited in this way. The earliest experiments were all directed to the placing of bodies in these two groups, till the discovery of *electric conduction* by Stephen Grey, which broke down the distinction and at the same time gave rise to experimenting and to progress in a more profitable direction. Stephen Grey found that some substances have the power of transmitting electricity from one place to another, while others are destitute of the property, or at least appear so to ordinary methods of experimenting. He allowed a long wire to hang down from an upper room through a hole in the floor and ceiling to the floor of the room below, and at the top he supported the wire with fine silk threads. Electrifying a rod of glass by friction, he brought it to the upper end of the wire, while a friend below watched the result, with the assistance of pith-balls suspended as described above, and they obtained all the phenomena we have just described at the lower end of the wire. It was plain from this that the wire was able to carry or conduct the electricity, but that the silk threads by which it was supported were not able to do so; and soon *conductors* and *non-conductors* were clearly recognized. Du Fay pointed out that all electrics are non-conductors, and all non-electrics are conductors. It then became evident that the reason why non-electrics cannot be electrified by friction is that the electricity is conducted away as rapidly as it is produced; and soon after it was shown that a metallic rod supported by a glass handle, *insulated*, as it is termed, can be electrified by striking it lightly with a dry cloth.

A very important matter now arises for consideration. Theories began to be started about the time of the discoveries just now alluded to. That of Du Fay and Symmers, and other hypotheses to account for the phenomena observed, began to be discussed. It had been proved that all bodies are capable of electrification, and it became necessary to examine both the body used as a rubber, usually some kind of fabric or cloth, and the body rubbed, usually some solid body. It was found that both bodies are electrified in every case, the one like glass rubbed with silk, and the other like wax rubbed with woollen cloth. Du Fay and Symmers thence assumed the existence of two electric fluids, which they called *vitreous* and *resinous*. They supposed these to exist in equal quantities in all neutral bodies, and that when two bodies are rubbed one on the other, the fluids are separated: one of the bodies becomes overcharged with one of the fluids, and the other with the other fluid: the nature of the bodies determining which shall receive the excess of the vitreous and which the excess of the resinous fluid. They assumed that each of these fluids repels other portions of itself: so that when a rod of glass has communicated some of its excess of vitreous electricity to a pith-ball, the glass rod and the ball become repulsive of each other, on account of the electricity they possess. The two electric fluids were, on the other hand, supposed to attract each other: thence a resinously electrified stick of sealing-wax brought near to a pith-ball which has been electrified by contact with an electrified glass rod, attracts it. The holders of this theory therefore took it for granted that when two bodies are rubbed together, the rubber and the body rubbed receive equal charges of opposite kinds of electricity. This we now know from Faraday's experiments to be strictly true, though we no longer hold the *double fluid hypothesis*, as that of Du Fay and Symmers is called. Franklin's theory of a single fluid will be stated immediately.

The next step was to arrange substances in order as follows: where each substance in the list becomes electrified vitreously if rubbed with any of those that follow, and resinously if rubbed with any of those that precede it:—

Cat skin.	Glass.
Flannel.	Cotton.
Ivory.	Silk.
Rock-crystal.	The hand.
Wool.	Sulphur.
Shell-lac.	Caoutchouc.
Resin.	Gutta-percha.
Metals.	Gun-cotton.

The order of such a list as this cannot, however, be considered absolute. Much depends on the state of the surfaces, on the temperature of the bodies, and so on. Thus if two rods or plates of the *same* glass, one of which is smooth and the other of which has had its surface roughened, are rubbed together, the rougher rod or plate is electrified like sealing-wax rubbed with woollen cloth; and when a white and black silk ribbon are drawn one over the other, the black one generally becomes resinously and the white one vitreously electrified.

Instead of the theory above alluded to, Franklin held that there is one electric fluid, which possesses an affinity or attraction for various substances in various degrees. In its natural condition every body is associated with a certain quantity of this

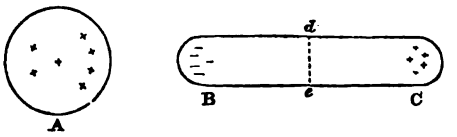
fluid. Friction of two dissimilar bodies together causes some of the fluid to leave one of them and pass to the other. Thus one becomes over-charged, or *positively* charged; and the other under-charged, or *negatively* charged. He considered a body electrified like glass to possess an over-charge; and thus positively electrified bodies are the same as vitreously electrified bodies, and negative electrification corresponds to resinous electrification. Franklin, to account for the attractions and repulsions exhibited by electrified bodies, assumed that the electric fluid repels itself and attracts matter, and that on this account two positively electrified bodies repel each other. He also supposed that two portions of unelectrified matter repel each other, in order to account for the mutual repulsion of negatively electrified bodies. This is, however, unnecessary; we may look on their repulsion as apparent, and due to the attraction which the electricity of the surrounding objects exerts on both the undercharged bodies. Modern naturalists generally admit the existence of one electric fluid, and only one: but whether it be that whose presence confers the properties of a vitreously electrified body or the opposite we do not yet know. Franklin's terms *positive* and *negative* are now always employed: it is plain, however, that this may be done without reference to any theory whatever.

The conducting powers of different substances vary greatly. Between glass and sealing-wax, which, to rough experiments, do not appear to conduct at all, and the metals, which at first sight seem to offer no resistance whatever to the passage of electricity, there are various grades. Thus bodies have been distinguished into groups as follows:—

Conductors.	Semi-Conductors.	Non-Conductors.
Metals.	Alcohol.	Dry metallic oxides.
Graphite.	Ether.	Fatty oils.
Solutions of salts and acids.	Dry wood.	Ice at −25° C.
Pure water.	Stone.	Phosphorus.
	Paper (moist).	Dry paper, &c.
	Ice at 0° C.	Wool.
		Silk.
		Gems.
		Glass.
		Wax.
		Sulphur.
		Resin.
		Amber.
		Gutta-percha.
		Caoutchouc.
		Shell-lac.
		Ebonite.
		Paraffin.
		Water vapour (*i.e.* dry steam).
		Gases.

Such an arrangement as this is made in connection with the part of the subject now before us, namely frictional electricity; but when we are concerned with the galvanic current we not only distinguish with great exactness between conductors, semi-conductors, and non-conductors, but we determine the minutest differences between the various so-called perfect conductors and perfect non-conductors, and we find that all conductors offer some resistance to the passage of the current, and that no body is altogether destitute of the power of conducting electricity. See RESISTANCE (ELECTRIC).

Electrostatic Induction is the next point to which we briefly refer in this place. The accidental discovery of the Leyden jar (see LEYDEN JAR) led to the knowledge of induction. When an electrified body is brought near to a non-electrified conductor, electrical disturbance takes place at the surface of the latter. Electricity of the opposite kind to that possessed by the electrified body is attracted to the side nearest to it, and the opposite kind of electricity is repelled. This may be beautifully shown by the following experiment:—



Let a body A, electrified positively, be brought near to B C, a long-shaped conductor which is divided into two parts at *dc*, but which, when B and C are put together in close contact, form one complete conductor. By the application of tests, for example by means of the electroscope, it may easily be shown that B, the end nearest to the electrified body A, is negatively electrified, while C is electrified positively. When A is carried away the negative electricity in B and the positive electricity in C reunite, and B C is found to be again in a perfectly neutral and undisturbed condition. But if, while A is in the neighbourhood of the conductor B C, the two parts B and C are separated, they are found to retain their electrification. To this phenomenon of electric excitement, produced in a conductor by the presence without actual contact of an electrified body, the name *electrostatic induction* is given. The term electrostatic is added to distinguish this species of induction from *current induction*, a phenomenon altogether distinct from that with which we are now concerned. (See INDUCED CURRENT, &c.) Electrostatic induction plays an important part in every electrical phenomenon that we are acquainted with. No accumulation of electricity can ever exist without the manifestation of induction. Thus if a conductor be insulated and electrified, and placed in a closed space, a room for example, induction is instantly called into play between the conductor and the walls that enclose it. Precisely as much electricity of the opposite sort is attracted to the surrounding surfaces as is possessed by the electrified body. If there be no walls the influence extends out to the earth, the clouds, or whatever surfaces may present themselves, and we have no reason to suppose that distance interferes either with the action itself or with the instantaneousness of it. It precedes and is essential to electrical discharge. Thus, when discharge is about to take place, induction is called into play intensely in a particular direction. When a thunder-cloud charged with negative electricity passes over a building, the whole surface of the building becomes electrified positively. If it be furnished with a lightning-conductor, the electricity may be heard and seen streaming from the point to the clouds, which are thus slowly and quietly discharged. The use of the conductor is to concentrate the inductive influence chiefly on itself, which it does on account of its shape. (See ELECTROSTATICS, DISTRIBUTION OF ELECTRICITY.) Many of our most important electrical instruments also are founded on electrostatic induction. The capacity of condensers of various kinds depends on it. See LEYDEN JAR, EPINUS' CONDENSER; also ELECTROPHORUS; INDUCTION (ELECTROSTATIC), MACHINES FOUNDED ON. For Faraday's theory of induction see INDUCTION (ELECTROSTATIC), and CAPACITY (SPECIFIC INDUCTIVE).

The properties of electricity in motion are of extreme importance. They are very fully described in the preceding article, ELECTRIC CURRENT, and under the head INDUCED CURRENTS, which are the transient currents produced in a wire or other conductor by the sudden transmission or stoppage of a current in another adjacent wire. Under MAGNETO-ELECTRICITY the currents produced in a wire by the motion of magnets in its neighbourhood are described.

Besides friction, there are various *sources* of electricity. The most important of these is the contact of metals. When a plate of copper and a plate of zinc are put in contact, and then separated by means of insulating handles, the zinc is found to be positively electrified and the copper negatively. The same is true of any pair of metals, and even of two plates of the same metal whose surfaces have been differently treated. This was first recognized by Volta, but it is only of late years that it has been established in a perfectly unambiguous way by Sir William Thomson. It was denied altogether by the holders of what is known as the 'chemical theory of the voltaic pile.' They attributed the electrification to chemical action of the oxygen and moisture of the air, and in particular cases to various other causes that need not be discussed here. Their theory, which will be found stated fully, with all the arguments for it, in the treatise of M. De la Rive, is now completely disproved, and contact electricity of metals is fully established. Under VOLTAIC PILE it is shown that the electric current of the pile and galvanic battery depends on contact electricity of metals.

It appears that whenever two dissimilar substances, or even two bodies whose substances are the same but whose surfaces have some difference, are put in contact and then separated electric disturbance takes place. Thus if a disk of cork and a disk of caoutchouc are pressed together and then separated the former is found electrified positively and the latter negatively. If a body whose surface is smooth and polished be pressed on a second body of the same kind, whose surface is roughened, electrification may often be shown on separation; and the same is said to be the case when two bodies of the same material, but one of them hot and the other cold, are pressed together. After cleavage many laminated minerals, such as mica, calcareous spar, &c., exhibit strong electrification at the surfaces of cleavage; when these surfaces are discharged they may be electrified again by pressing them together and separating them. Change of temperature produces electric excitement in some minerals. Tourmaline, and others, when heated in a flame, exhibit strong electrification at the two ends of the principal axis as long as heating is going on. One end of the crystal is positive and the other negative. When removed from the flame polarity is again exhibited during cooling, but of the opposite kind, the end that was positive during heating being now negative. The name *pyro-electricity* is given to phenomena of this kind. Lastly, we mention *thermo-electricity*, referring our readers, however, to our article under that name, and to THERMO-PILE, for full information on this important subject. When a complete circuit is formed by soldering two different metals together, thus, one end of a copper wire to one end of an iron wire, and likewise the other ends of the wires, and when one of the junctions is maintained at a higher temperature than the other, a current is kept up, which, in the case of copper and iron, passes from the copper to the iron through the hot junction. The direction of the current and the electro-motive force in the circuit depend on the metals employed.

The applications of electricity are extremely varied; and as our knowledge of the subject has increased they have rapidly become more important, or rather essential to our daily life. Thus its employment for telegraphy and electro-metallurgy, for chemical and for medical and physiological purposes, for the regulation of clocks, &c., may be mentioned as examples. These, from the nature of this work, are considered under their special names.

ELECTRICITY, DISSIPATION OF. The gradual loss of electricity from a charged body surrounded by non-conductors, which takes place by means of them, is called *dissipation of the electric charge*. A charged conductor, for instance, supported on a glass pillar, slowly loses its electricity. This is due partly to the creeping of the electricity along the surface of the glass, which, even if it be as free from dust and dirt as we can make it, is never absolutely free from an invisible film of moisture, and partly to the air that surrounds the conductor, the particles of air becoming charged and flying off carrying electricity with them. In performing delicate experiments, such as those of Coulomb for determining the laws of the distribution of electricity on conductors, this gradual loss must not be neglected; and accordingly Coulomb made a careful investigation into the laws of dissipation, by which he was able to allow for it in cases where he could not arrange his experiments so as to be undisturbed by it. Coulomb was led by his experiments to abandon the use of glass as a support for his conductors whenever it was possible, employing instead thin stems of shell-lac, and sometimes suspending small electrified bodies by well-dried silk fibres. He found that the amount of loss in a given time by means of the particles of air diminishes as the charge possessed by the conductor gets weaker and weaker, the law followed being the 'compound interest', or logarithmic law. Loss of the kind just mentioned is frequently called *discharge by convection*.

ELECTRICITY, VELOCITY OF. See VELOCITY OF ELECTRICITY.

ELECTRIC LIGHT. There are various ways in which electricity may produce light: the sparks, for instance, due to the discharge of electrostatic accumulations, give an intense light, of which lightning-flashes are the most magnificent example; the silent discharge of the induction-coil through a partial vacuum gives lights of extraordinary beauty (see VACUUM TUBES); light may also be obtained by keeping a platinum wire at a white-heat by the passage of a galvanic current. The name electric light is, however, generally applied to the light obtained when a powerful battery is connected with two carbon terminals, and sparks caused to pass between them. It may be roughly shown by simply connecting two pieces of the very hard compact carbon that is found in the heads of gas-retorts to the electrodes coming from a powerful battery, and with the hands alternately bringing the carbons in contact and separating them again. Flashes of extraordinary brightness may thus be obtained. The experiment may also be performed under water.

If the two carbon terminals are brought into contact, and if they are then cautiously separated to a very slight distance, the current may be made to pass continuously between them. It appears to be conducted across the short interval by the stratum of intensely heated air mixed with heated particles of carbon. During the passage of the current there is a transference of carbon from the positive terminal to the negative terminal. Both carbons waste away, but the former at double the rate of the latter. On examining the two, also, with the help of coloured glasses, the positive pole has a hollowed-out appearance, owing to its particles being carried off; and the other, which is receiving particles, has an appearance of being heaped up. Owing to the wasting of the points, and to the necessity of keeping them at as nearly as possible a fixed distance from each other, a mechanical arrangement for making them approach each other gradually must be used in order to obtain a permanent light. To keep the light always in the same position, also, the positive point must be moved forward at double the rate of the other. The best of such contrivances is perhaps that of Duboscq. See also VOLTAIC ARC.

ELECTRIC MACHINE. Soon after the discovery of the most elementary facts in the science of electricity, machines were arranged for the purpose of obtaining a more continuous supply of the electric fluid than could be got by holding a glass rod or a stick of sealing-wax in the hand and rubbing it with a silk or woollen cloth. The first of these were spheres of resinous matter like sealing-wax, or glass globes, which were turned round on an axis passing through the centre, while a dry hand was applied as a rubber. Near the globe was hung a metallic bar, which was suspended by silk threads. This became electrified by sparks which passed from the electrified globe; and sparks were readily obtained from the conductor when the hand or any other body was brought near. This simple machine was tolerably effectual, but great improvements on it were soon introduced.

The cylinder machine is shown in fig. 2, Pl. LI. A glass cylinder, E F, is turned on its own axis by means of a handle. It is supported sometimes on pillars of glass D and C, but often on wooden uprights. G and I are two metallic cylinders with carefully rounded ends, which should be very smoothly finished to prevent dissipation of electricity from any pointed projections. They are supported on glass pillars J and K, and these pillars are usually carefully covered with shell-lac varnish to improve their power of insulation. To the *conductor* G (which is called the negative conductor for the reason that is explained below) is attached the *rubber* H, which is a long horse-hair cushion covered with silk; and a flap of silk attached to it lies on the top of the glass cylinder while it is being turned. The other conductor I carries a horizontal row of metallic points, like a comb, which point towards the glass cylinder: and a round knob or ball like that on the conductor G, but which is hidden in the figure, generally projects from it. I is called the *prime conductor* of the machine. Usually both the conductors G and I are adjustable by means of the screws M and N; the former is always adjustable in order that more or less pressure, as required, may be brought to bear on the glass cylinder.

When the cylinder is turned it is rubbed by the silk rubber and becomes excited; and when the part that has been rubbed is moved round so as to be opposite the metallic comb on I it is discharged by the points, the prime conductor thus receiving positive electricity, which it then gives off to any body brought near to it. The glass, discharged, passes on to be rubbed again by the silk at H. But it must be observed that the mere rubbing of glass and silk together *can do nothing more than establish a certain difference of potentials between these two bodies;* and it will be recollected (see ELECTRICITY) that in working the machine, as we have described it hitherto, the silk rubber and the negative conductor are becoming negatively charged. Consequently, after a few turns at the most, when the negative conductor has reached a certain electrification, no more positive electricity is obtainable from the glass till the negative conductor has been discharged. For this reason the chain shown in the figure is led from the negative conductor to the earth, and the conductor is thus kept discharged. Under these circumstances a constant flow of positive electricity from the glass to the prime conductor is obtained.—If it be required for any purpose to obtain a supply of negative electricity the chain is removed from G and connected with the prime conductor, when negative electricity may be got from the former.—The efficiency of the machine is found to be much increased by smearing the silk cushion with an amalgam made by rubbing together in a mortar one part of tin, two of zinc, and six of mercury. This is usually put on mixed with a small quantity of lard. The effect in the way of increasing the power of the machine is very remarkable. Its action is not very well understood and is frequently discussed, but it seems likely that the chief use of it is to discharge the negative electricity of the silk more perfectly than it could be discharged without the aid of it. The use of the flap of silk which is attached to the silk rubber and lies over the cylinder is chiefly to prevent dissipation of the electric charge which the glass receives at the rubber till it reaches the discharging points of the prime conductor. In working the machine great care must be taken to have the rubber and flap perfectly dry, and for this purpose the rubber is always made removable, and should be carefully dried before the fire. When the cylinder gets dirty, which it often does from the amalgam adhering to it, it ought to be washed with soap and water, and afterwards wiped with a cloth moistened with spirits of wine. The glass support of the prime conductor must be most carefully wiped free of dust and well dried and warmed. Attention to these points will make a difference in the working of the machine that can scarcely be believed without experience.

The cylinder machine, though excellent, is now nearly superseded by what are known as *plate machines*. One of these, Ramsden's machine, is shown in fig. 3, Pl. LI. In principle it is precisely the same as that just described. The plate is ¼ inch or more in thickness, and from 1½ to 4 feet in diameter. The rubbers, of which there are two, one at the bottom, I, and the other at the top, are in the form of broad clips faced with horse-hair cushions which are covered with silk, and to which the silk flaps shown in the figure are attached: the flaps are kept in their place by stays of whale-bone. The clips can be tightened on the glass by means of screws shown in the upper rubbers. H is the prime conductor: it carries a comb attached to the leg at G, and another diametrically opposite to it. The prime conductor H is supported on a horizontal glass arm, which is seen through the glass plate. In all respects Ramsden's machine is similar in its working to the cylinder machine, except that the rubbers are not insulated on glass, and the machine is therefore not fitted for giving negative electricity. The plate machine arranged by Winter of Vienna is a modification of that just described. Its chief feature is the addition of a great *ring*, which is attached to the prime conductor. This ring is constructed as follows. A very thick iron wire is bent into a circle of 3 or 4 feet in diameter at least. It is covered with mahogany, and looks like a wooden ring of 2 or 3 inches section. It stands vertically up above the prime conductor on a stalk made in the same way. Its use is to increase the *capacity* of the prime conductor, and when it is attached electricity is collected in great quantity, and issues from the conductor in the form of sparks or flashes to a body placed at 14 inches distant or even more.

Other electric machines are described under ELECTROPHORUS, HYDRO-ELECTRIC MACHINE, INDUCTION (ELECTROSTATIC), MACHINES FOUNDED ON.

ELECTRICS and NON-ELECTRICS (Greek, *ēlektron*, amber). The chief work of the earliest experimenters in electricity was to divide bodies into *electrics*, which they could excite by friction like amber; and *non-electrics*, which, like the metals, they could not excite. These names were given to the two classes by Gilbert of Colchester, 1600. But Du Fay (1733–45) showed that electrics are identical with non-conductors, and non-electrics with conductors; and that the reason why non-electrics cannot be excited by friction is that the electricity is conducted away from them as fast as it is produced. The dis-

tinction betweeen these classes was thus broken down. The terms, however, are still occasionally used.

ELECTRIC TELEGRAPH. See TELEGRAPH (ELECTRIC) and SUBMARINE CABLE.

ELECTRODE (Greek, *hodos*, a way), a term introduced by Faraday to denote the surface at which electricity either enters or leaves a body under electrolytic decomposition, in order to avoid the ambiguity and the implied theory connected with the use of the older terms *pole, positive pole, negative pole.* He called the electrode at which the current enters the *anode* (*ana*, upwards, the way that the sun rises), and the electrode at which the current leaves the electrolyte the *kathode* (*kata*, downwards, the way that the sun goes down). The latter terms are rarely used; but the term electrode is now used even in a more extended sense for the way by which the current enters, or might enter, any body. For instance, we speak of the electrodes of an electrometer or a galvanometer, and of the electrodes of a battery.

ELECTRO-DYNAMICS, the science which treats of electricity in motion through a system of conductors; a name used in contradistinction to *electro-statics*, or the science of electricity in *equilibrio.* The term is not, however, a good one. *Electro-kinetics* might be used instead (see DYNAMICS). For the facts belonging to this science see the articles ELECTRO-MAGNETISM, ELECTRICITY, and GALVANISM.

ELECTROLYSIS (Greek, *lucin*, to loosen or disengage) is the resolving of certain compound bodies into their elements, or, in some cases, into groups of elements, under the action of a current of electricity. In 1800, shortly after the discovery of the voltaic pile, Nicholson and Carlisle showed that if two platinum plates connected with the opposite extremities of a pile are made to dip into acidulated water oxygen is given off at the plate connected with the copper end of the pile and hydrogen is given off at the other plate. Shortly after Davy obtained the metal potassium by passing a current through fused potash, and soon many of the alkalies and alkaline earths were resolved into their elements. Faraday investigated the laws of electro-chemical decomposition minutely; and our knowledge of these laws is chiefly due to him. It is one of the most important and interesting of all electric phenomena, tending, as it does, to furnish us with an insight into the nature of the electric current on the one hand, and into the nature of chemical union on the other.

The following are the main facts to be mentioned. When an *electrolyte* (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient intensity it is broken up. The elements of which it is composed appear, one of them at one electrode, and the other at the other electrode, if the compound be a binary one; thus, if two platinum plates connected with the battery be plunged in a trough containing fused chloride of silver the chlorine is given off at the plate by which positive electricity enters, that is, at the plate which is connected with the copper plate of the battery, and the silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for every 108 grammes of silver deposited at one side of the vessel 35·5 grammes of chlorine are given off at the other side. If the electrolyte is composed of more than two elements it is divided up into groups, which are liberated at the two electrodes in a similar way. Thus sulphate of sodium is decomposed into sodium, which is found at the electrode connected with the zinc end of the battery, and a group consisting of one equivalent of sulphur and four of oxygen, which are set free at the other electrode. When a compound consisting of a metallic and a non-metallic part is decomposed the non-metallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. In the case of acids hydrogen acts as a metal, and the same may be said of the molecular group called ammonium by chemists (found in the salts chloride and sulphate of ammonium) and of other corresponding groups.

Electrolysis takes place only when the electrolyte is in a liquid state. During electrolysis there is a transfer of the materials of which the compound is made up from one part of the vessel that contains it to the other. After a time we find (taking the instance above, chloride of silver) the silver collected at one side of the vessel, the chlorine having been given off at the other. The way in which this transfer takes place has been imagined by Grotthüss (see GROTTHÜSS' HYPOTHESIS): and there can be no doubt that during electrolysis a species of discharge very different from that of ordinary conduction takes place. It depends chiefly, if not altogether, on a convective action in which the elements of the compound move with and against the electricity flowing, and on the average along the lines of flow. The process, therefore, requires free mobility of the particles not afforded by a solid.

The electrolytic action of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance all *in series* (that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be as much silver, by weight, deposited at one side, and as much chlorine set free at the other.

The same quantity of electricity decomposes chemically equivalent quantities of different electrolytes. If, instead of passing the current through a series of cells, each containing the same electrolyte, we expose different electrolytes to its action, for example, water, fused chloride of silver, solution of sulphate of sodium, and collect the products of decomposition, we find that the quantities set free of hydrogen, silver, and sodium on the one hand, and of oxygen, sulphion (SO_4), and chlorine on the other, are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action that goes on in each of its cells is chemically equivalent to that in each of the decomposing cells. It is, however, to be remarked, that when such a body as sulphate of sodium *in solution* is electrolysed the results are at first sight different from what has been stated above, for we find on comparing a cell containing sulphate of sodium with a cell containing acidulated water that not only is the sulphate of sodium electrolysed, but there is at the same time as much hydrogen given off on one side and oxygen at the other as in the water cell. This, however, is now recognized as *secondary action;* for the sodium set free at one side, combining with the water of solution, forms soda (Na_2O), and liberates hydrogen; while the sulphion (SO_4) set free at the other, combining with water, forms sulphuric acid, and liberates oxygen. It is sometimes difficult to separate the effects due to true electrolysis and to secondary action. By many pure water is considered not to be an electrolyte. To decompose water it is necessary to acidulate it slightly, because when the experiment is tried with perfectly pure water its resistance is found so great that the current will not pass through it. But if a little sulphuric acid is added to it the electrolysis is easily effected. It is therefore supposed that the sulphuric acid (H_2SO_4), breaking up, yields

hydrogen, H_2, at one electrode, and SO_4 at the other, and that the oxygen observed to be set free is given off during the combination of the latter group with water to form sulphuric acid again. Thus the sulphuric acid remains undiminished in quantity during the action, and the elements of water alone are set free.

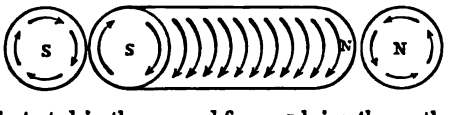
The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. The current being measured as usual by means of the galvanometer (see ELECTRIC CURRENT), it is found that a double current gives double electrolytic decomposition, and the law stated above is found to hold with perfect exactness. On account of the definiteness of the action Faraday proposed to measure the strength of a current by collecting and measuring the quantity of the gas given off during the decomposition of water. See VOLTAMETER.

Little progress has been made in finding the laws of electrolysis of mixed electrolytes, though the Becquerels, Matteucci, Daniell, and Miller applied themselves to the examination of the question. Generally when a current is passed through a mixture of several electrolytes all of them are somewhat acted on, but the quantitative laws of the subject are not understood.

ELECTROLYTE. See previous article.

ELECTRO-MAGNETISM, the name applied to a very interesting class of facts, originally developed by Professor Oersted, of Copenhagen, in the year 1819. The power of lightning in destroying and reversing the polarity of a magnet, and in communicating magnetic influence to iron previously not magnetic, had long been known, and had led to the supposition that similar effects might be produced by the common electrical or galvanic apparatus. The first observation of Professor Oersted was, that an electrical current, such as is supposed to pass from the positive to the negative pole of a voltaic battery, along a wire which connects them, causes a magnetic needle placed near it to deviate from its natural position, and to assume a new one, the direction of which depends upon the mode of conducting the experiment. When the wire is extended horizontally in the line of the magnetic meridian, parallel to a freely suspended compass needle, whose centre is directly under the wire, the needle instantly deviates from the magnetic meridian, and declines towards the west, under that part of the conjunctive wire which is nearest the negative electric pole, or the zinc end of the voltaic apparatus, the amount of declination depending upon the strength of the current and the sensibility of the needle. If we change the position of the conjunctive wire towards the east or the west, but still parallel to the magnetic meridian, no change in the above result takes place, except that of its amount. But if the wire be disposed horizontally *beneath* the needle, the effects take place in an inverse manner; that is, the pole of the needle, under which is placed the portion of the conjunctive wire which is nearest the negative pole of the battery, declines towards the east. When the conjuctive wire is stretched alongside of the needle, in the same horizontal plane, it occasions no declination, either to the east or west: but it causes it merely to incline in a vertical line. Such was the nature of the first discovery in electro-magnetism. It was no sooner announced than the experiments were repeated and varied by philosophers in all parts of the world; and a multitude of new facts were soon brought to light through the labours of MM. Ampère, Arago, and Biot, in France, and Sir H. Davy and Mr. Faraday in England. Two important discoveries were announced by Ampère and Davy,—that the conjunctive wire appeared to become itself a magnet, and that magnetic properties might be communicated to a steel needle not previously possessing them, by placing it near the electric current. The former of these facts was proved by throwing some iron-filings on paper, and bringing them under the wire, when they were observed to adhere to it, forming a tuft around it ten or twelve times the diameter of the wire; on breaking the connection with the battery, they immediately fall off, proving that the magnetic effect depends entirely on the passage of the electricity through the wire. It is now known, however, that the wire does not attract the filings, but merely communicates magnetic properties to them, so that their apparent attraction arises from their adhesion to each other, when they form a complete ring or circle around the wire. A battery of very large plates, such as is used for producing intense heat and light, was found to give the strongest magnetism to the wire connecting its poles. Accordingly it was observed that the calorimotor of Dr. Hare, a galvanic arrangement in which the plates were several feet square, exhibited the strongest magnetic effects, and this notwithstanding the powerful heating or calorific effects that accompany its action. To communicate magnetic properties to steel needles, it is necessary to place them across the wire. They then become permanently magnetized, and retain their power equally with needles prepared in the ordinary way. The direction of magnetization depends on whether the needle is placed above or below the wire. When a needle is placed under the conducting wire the positive end of the battery being on the right hand of the operator, the end of the needle next to him becomes the north pole, and the other end the south pole. On the contrary, when a needle is held above the wire, the reverse of this takes place; the end next to the observer becomes the south, and the other the north pole. The same opposition is observed when needles are placed in a vertical position, on different sides of the wire: in those on one side, the lower ends are found to be north poles, while in those on the opposite side of the wire the upper ends are north poles, and the lower extremities all south poles. Contact of the steel needles with the conducting wire is not necessary, for they become instantly magnetic when brought near it, nor does the interposition of a plate of glass interfere with the magnetization.

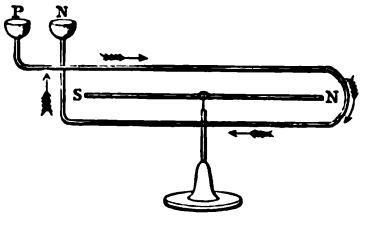
In prosecuting these inquiries Ampère discovered another remarkable fact—viz. that when two wires, each of which has a current flowing through it, are brought near to each other, magnetic attractions and repulsions take place between them. When so arranged that the electric current passes along each wire in the same direction, the two wires attract each other; but when the electric currents in the two wires flow in opposite directions, the wires repel each other. Upon this experiment Ampère founded his celebrated theory of magnetism—viz. that it arises from the attractions and repulsions of currents of electricity constantly circulating around every magnet, as



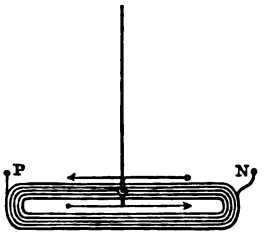
illustrated in the annexed figure, S being the south, and N the north pole. To account for these currents he supposes that the molecules of iron have circulating round them currents of electricity, which, when the iron is magnetized, are all caused to flow in similar directions. Thus to an observer looking on the pole S they would all appear to flow in a right-handed direction. It will readily be perceived that the

resultant effect of these molecular currents would be the same as if currents were flowing in parallel circles round the magnet. The mutual repulsion of two magnetic poles of the same name, and the attraction of two dissimilar poles, are simple consequences of this hypothesis. It is conceived to explain also why the magnetic needle places itself at right angles to a wire conducting electricity, namely thus, that the electric currents circulating round the magnet tend to coincide in direction with that passing along the wire. The magnetic effects produced by galvanic arrangements are obtained likewise by electricity evolved from the common machine, and still more from the discharge of an electrified Leyden jar; the magnetism communicated agreeing in every respect as to the permanence of the polarity, the variations when the needle is placed above or below the wire, &c., with that produced by the voltaic pile. Magnetism is best communicated to needles when the wire is formed into a hollow screw, or helix, and the needle to be magnetized, wrapped in paper or put into a glass tube, is placed in the centre of it, and the communication with the galvanic battery established. This arrangement conveys the electric current by the spiral convolutions, round and round the needle, and (according to the theory of Ampère) communicates to it, or develops in it, the electric circulation constituting magnetism. The position of the north and south pole depends on the direction of the current. The end of a left-handed helix at which the positive current enters becomes the north pole.

Galvanometers.—Not only did Oersted's great discovery fully establish the existence of an intimate connection between electricity and magnetism, but it furnished what had hitherto been wanting—a ready and convenient method of determining the *presence*, the *direction*, and the *strength* of a galvanic current. It is true that to produce a sensible effect on the magnetic needle with a single wire requires a current of considerable power, but soon after Oersted's discovery the happy idea occurred to Professor Schweigger of Halle, that the effect might be multiplied by surrounding the needle with several convolutions of wire. The principle of this arrangement will be understood from the simple elementary apparatus here repesented. The needle N S, supported on a fine point, is nearly surrounded by a wire bent



into an oval or rectangular form, and terminating in the mercury cups P, N. If the end of a wire from the positive pole of a battery be dipped into the cup P, and that of another from the negative pole into the cup N, the current will proceed in the direction shown by the arrows, passing from left to right above the needle, and from right to left below it. Now, by referring to the explanation which has been given of the movements observed by Oersted when the needle was placed in different positions with regard to the wire, it will be seen that two currents, or two parts of the same current, one of which passes *over* the needle from south to north, and the other *under* it from north to south, will conspire to deflect the north pole of the needle westward; and in like manner, if the current be reversed, by reversing the connection of the battery-poles with P and N, the two parts of the current will conspire in deflecting the north pole eastward. By this simple arrangement, therefore, the action of the current upon the needle is doubled; and by multiplying the convolutions of wire, as in the annexed figure, we increase the effect upon

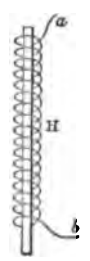


the needle in proportion to the number of convolutions, except in so far as the strength of the current is diminished by the greater resistance. In forming a coil of this description, copper-wire, as one of the best conductors, is generally used; and to prevent metallic contact between the spirals, and to compel the current to traverse the whole length of the coil, the wire must be covered with silk, cotton, or some other insulating substance.

The sensibility of an instrument of this kind is still further increased by using an astatic combination, consisting of two needles with their poles reversed, as shown also in the last figure—one of the needles being suspended within, the other above the coil. The advantages of this arrangement are twofold. In the first place, the opposing directive force of terrestrial magnetism is neutralized, so that the needles are *astatic*, or indifferent in any position; in the second place the effect of the upper half of the coil on the upper needle co-operates with that of the entire coil on the interior needle, so that the action of the current is still farther increased. Two magnetized sewing needles, passed, with their poles reversed, through a piece of straw, and suspended by a silk fibre, serve the purpose perfectly. One of the needles should be rather longer or thicker than the other, so that the system, while nearly balanced, may still retain sufficient directive force to bring it to a constant position when uninfluenced by any electrical current.

An instrument constructed on these principles, with or without an astatic combination, but provided with a circular scale of degrees, and the whole covered by a glass shade to protect the needle or needles from currents of air (as shown in fig. 6, Pl. LII.), is termed a *multiplier*, and sometimes a *galvanometer*. There are various forms of galvanometer, all founded on the principle here indicated. The most important forms will be found described under GALVANOMETER.

Electro-magnets.—We have seen that Ampère discovered the permanent magnetization of steel needles, and the temporary magnetization of iron-filings by means of the electric current. We have stated also that he adopted the method of placing the steel needle or bar within a coil or helix of copper-wire, and in doing so he found that if the helix H was wound from right to left *over the needle*, as at *b* in the annexed figure, the end of the needle at which the positive current entered became the north or marked pole, but if wound from left to right the end at which the current entered became the south pole. In 1826 Mr. Sturgeon, of London, first applied these principles to the construction of an apparatus which has now become of great value as an instrument of experiment and research, as well as for telegraphic purposes. Substituting a bar of soft iron for the steel needle he found that so long as the current passed through the



coil a high degree of magnetism was excited, which almost entirely vanished the moment that the current was interrupted. Magnets of this description are therefore termed *electro-magnets* or *temporary magnets*. It is found, indeed, that soft iron is capable of receiving a much higher magnetism in this way than bars of steel, and there is the additional advantage over the permanent magnet that we are enabled to regulate the force either by varying the power of the battery or the extent of the coil, as well as to reverse the poles at pleasure, by changing the direction of the current.

The most powerful electro-magnets are those in which the iron *core* is bent into the form of a horse-shoe, as in fig. 7, so as to bring the two poles into such a position that they may act with their united force upon the *armature* A B. The copper-wire forming the coil must be insulated with silk or cotton, as in the galvanometer, so as to compel the current to traverse its entire length, and the wire must be wound invariably in the same direction in which it is commenced. In the figure the spiral is left-handed, and therefore the end at which the positive current enters, whether it be A or B, will become the north pole. At first it was usual to continue the coil along the whole length of the core; but experience has proved that the effect of the current is greatest towards the two extremities; and that when the wire is of considerable length, the additional resistance introduced by continuing the coil along the middle portion more than counterbalances the advantage. The plan now generally adopted, therefore, is to cover with several layers of wire only the two limbs, and this is most conveniently done by first winding the insulated wire on short bobbins of brass tube, of sufficient diameter to admit the core, the limbs of which are inserted after the coils have been separately made. The wire must be coiled on the bobbins in such a way that in passing from the one to the other, it shall proceed in the same direction as if it had been carried continuously around the entire length of the core. Fig. 8 represents an electro-magnet of this description, fitted in a wooden frame to admit of experiments upon its lifting power.

The wire that is used in forming the coil depends on the nature of the battery used to excite the electro-magnet. The rule for the most advantageous employment of the battery in this, as in all such cases, is that the internal resistance of the battery should be equal to the resistance of all the conductors outside it. Hence, with a battery of very small resistance thick wire for the coil may be employed; but when the resistance of the battery is very great, the wire may be very fine and long. In coiling the wire on the magnets, the same rule with respect to using wire thicker and thicker for the outer layers of the coil, as is stated under GALVANOMETER, is to be adhered to.

We have said that the magnetic power to be obtained by a current of electricity far exceeds what can be permanently imparted to steel. The most powerful permanent magnet in the Great Exhibition of 1851, for which a council medal was awarded to Mr. Logeman (Netherlands), weighed 101 lbs. 12 oz., and carried a weight of 436 lbs. The next in power was one constructed by Mr. Henley, of London, which weighed 32 lbs., and carried a weight of 120 lbs. But an electro-magnet constructed by Mr. Joule, and also shown at the Exhibition, was capable of lifting a ton weight, or 2240 lbs.; and others of much higher power have been made. In 1830 M. Pouillet constructed an electro-magnet for the Faculty of Sciences at Paris, consisting of two horse-shoes, each wrapped with 10,000 feet of copper-wire, and so arranged that the poles of contrary names should be in contact. With a current of moderate intensity this apparatus supported a weight of many tons.

A small horse-shoe electro-magnet, with a core of ¼ to ½ inch in diameter, and 5 or 6 inches long, having three or four layers of covered wire of the thickness of bell-wire twisted round each limb, will lift 10 or 12 lbs. when excited by only a single pair of Smee's battery, with plates 4 inches square.

In constructing an electro-magnet, the use of cast-iron must be avoided, as it partakes of the nature of steel; malleable-iron should be used; and even the purest and softest that can be made always retains a certain amount of attractive force after the current ceases. When a rapid motion of the armature is required, the effect of this residuary magnetism may be neutralized by covering the surfaces of contact with varnish or thin paper.

Electro-magnetic Engines.—The enormous force developed by electro-magnetism, and the great facility of annulling or reversing it in an instant, has given encouragement to the hope that it might be successfully substituted for steam as a motive power, and a great amount of talent and ingenuity has been expended in attempts to realize this object. Hitherto these efforts have not been attended with the success which was at first expected; and Liebig, Joule, and other high authorities have expressed a decided opinion that electro-magnetic engines can scarcely ever be a cheap or very efficient source of power, because the zinc and acid required to produce the power in this way are much more costly than the coal which would evolve an equal amount of mechanical energy in the form of heat. In some cases, however, where the heat and smoke of a steam-engine would be inconvenient, and where economy and intensity of power are of less consequence than facility of application, the electro-magnetic engine has been turned to useful account. It has been employed, for example, by M. Froment, of Paris, a celebrated maker of mathematical and astronomical instruments, to graduate the divided circles of apparatus requiring extreme accuracy, and for other purposes. It is also now used, and found very convenient, by Sir William Thomson, in his siphon recorder, an instrument for recording electric signals in telegraphy. The electro-magnetic engine is there employed in driving the slips of paper on which the marks are received, and for working the machinery of an electric machine. An electro-magnetic machine is represented in fig. 9; it consists of four electro-magnets of the horse-shoe form, supported in a frame M N of cast-iron, and through each of which in succession a powerful current is made to circulate. Eight keepers of soft iron are disposed around the circumference of a massive wheel D, so as to pass successively, when the wheel is in motion, before the poles of the magnets. The two ends of each of the coils are connected respectively with the terminals A and B, which receive also the wires from the battery; and by means of a small toothed wheel fixed upon the axis of the large one, the connection is completed and broken at certain stated intervals. This is effected by so adjusting three springs fixed to the small semicircular piece of copper *a b*, that each of them completes the connection when it presses against a tooth of the wheel. Two of these springs are respectively connected with the two horizontal electro-magnets, and the third is connected with each of the other two, which are therefore always in the same condition. The connections are so made that a current is transmitted through each coil at the moment when one of the keepers is approaching it, and ceases at the instant when the keeper arrives exactly opposite. In this way a current is always passing through at least one

of the coils, one of the keepers is always attracted, and the wheel itself in revolving completes and interrupts the circuit automatically.

In 1832 Professor Jacobi, of St. Petersburg, tried the experiment of propelling a boat by the agency of electro-magnetism. The vessel was 28 feet long, and was equipped with paddle wheels, to which rotatory motion was communicated by an electro-magnetic engine. When loaded with ten or twelve persons it went at the rate of 4 miles an hour, which is admitted to have been more than was accomplished by the first little boat that was propelled by steam; but a long period has now elapsed since 1838, and little improvement has been accomplished. In 1842 an electro-magnetic locomotive, constructed by Mr. Robert Davidson, was tried on the Edinburgh and Glasgow Railway, but in this case also the highest rate of speed attained was only 4 miles an hour. Mr. Joule estimates that the consumption of zinc per twenty-four hours to produce one horse-power by electro-magnetism is, in a Grove's battery, 45 lbs., and in a Daniell's battery 75 lbs. See also MAGNETO-ELECTRICITY.

ELECTRO-METALLURGY, the art of depositing metals from solutions of their salts upon metallic or other conducting surfaces, by the agency of voltaic electricity. Originally this art was known by the name of the *electrotype*, because it was at first practised with a view to the multiplication of type, copper-plate engravings, medals, and other works of art; but it was soon found to admit of application to various metallurgical processes, such as the reduction of metals from their ores, the analysis of alloys, &c., and latterly it has almost entirely superseded the old methods of gilding and silvering. It has become, indeed of great importance in various departments of manufacturing industry, and therefore the name *electro-metallurgy*, first introduced by Mr. Smee, and now generally adopted in this country, is much more appropriate than *electrotype*, or even than the term *galvano-plastic*, commonly used on the Continent.

The art is quite of recent discovery, and may be said to have owed its origin to the introduction of Daniell's constant battery in 1836. It is true that in operating with different metallic solutions, chemists and electricians had repeatedly observed detached facts depending on the same principles. Even so early as the year 1800—the same year in which Volta discovered the pile—Mr. Cruickshanks of Woolwich, in transmitting the galvanic current through an ammoniacal solution of copper, observed that metallic copper was precipitated, 'the purest he had ever seen;' and he adds—'From these experiments it would appear that the galvanic influence might be employed with success in the analysis of minerals, more particularly in separating lead, copper, and silver, from their different solutions.'[1] Again, in 1801, Mr. Wollaston observed that when zinc and silver plates were made to touch each other in a sulphate of copper solution, copper was precipitated on the silver (Philosophical Transactions, 1801, p. 427). In 1805 Brugnatelli, professor of chemistry in the University of Pavia, wrote to Van Mons—'I have lately gilt in a complete manner two large silver medals by bringing them into communication, by means of a steel wire, with the negative pole of a voltaic battery, and keeping them one after another immersed in ammoniuret of gold, newly made and well satured' (Philosophical Magazine, 1805).

[1] This important observation of Mr. Cruickshanks, which has never previously been noted, occurs in Nicholson's Philosophical Journal, quarto series, vol. iv. p. 260.

All these observations passed without much notice until the discovery of Daniell's constant battery, in which a metallic solution—sulphate of copper—is one of the two liquids employed, and a constant deposition of the copper is a necessary part of the action. For a full explanation of the principles and construction of this battery the reader is referred to the article DANIELL'S BATTERY; but as a thorough knowledge of its action is essential to a clear understanding of the subject of the present article, the annexed

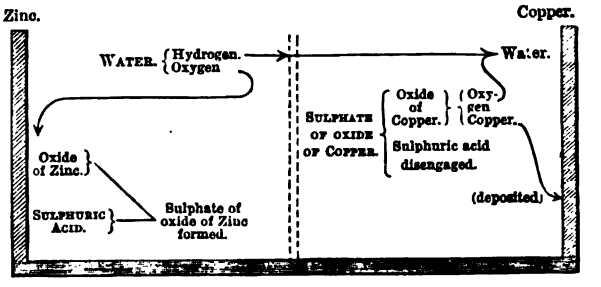


diagram may be found useful for this purpose. The dotted lines represent the porous partition separating the two liquids. On the left hand is the zinc plate immersed in water, acidulated with sulphuric acid; on the right hand the copper plate, in a saturated solution of sulphate of copper. On connecting the two plates by a wire the action begins by the combination of the oxygen of the water with the zinc, forming oxide of zinc, and this combines with the sulphuric acid (SO_3) to form sulphate of zinc (ZnO,SO_3), which is dissolved and accumulates in the liquid. The hydrogen of the water suffers a series of molecular displacements continued through the porous partition, and would be liberated at the surface of the copper plate, but in the act of liberation it unites with the oxygen of the oxide of the sulphate of copper, so as to reconstitute water; and as the copper when deprived of its oxygen cannot combine or remain in combination with sulphuric acid, it separates and is deposited in the metallic state upon the copper surface, while the sulphuric acid that is set free combines with the newly-formed water, for which it has a powerful affinity. There is therefore in this battery no disengagement of gas at the copper plate, and consequently no adhesion of hydrogen to it; but in place of the gas there is a constant deposition of metallic copper upon the copper surface.[2]

In the same year in which this battery was made public Mr. De la Rue contrived a modification of it, with reference to which he made the following observation in a paper printed in the Philosophical Magazine for that year (1836)—'The copper plate is covered with a coating of metallic copper, which is continually being deposited; and so perfect is the sheet of copper thus formed that, being stripped off, it has the counterpart of every scratch of the plate on which it is deposited.' The same fact was repeatedly observed by Professor Daniell himself; but it was not until 1839 that the idea of its practical application to a useful purpose was first publicly suggested, and then it appears to have been made almost simultaneously in England and in Russia. In Oct.

[2] The statement here given of the action that goes on in a Daniell's cell is not in accordance with the language of modern chemistry. But as it represents the matter clearly from the older point of view, and as it is still employed by practical cultivators of the art, we have retained it. The reader will do well to compare it with the language used in the article just referred to, DANIELL'S BATTERY. In many respects the old language compares favourably with that employed now.

1838, M. Fuss announced to the Academy of Sciences at St. Petersburg that Professor Jacobi had just made a discovery which promised important results for the art of copperplate engraving. The nature of the process was not then published, but in the Athenæum of May 4, 1839, a paragraph appeared stating that M. Jacobi had discovered a method of converting any line, however fine, engraved on copper into a relief, by a galvanic process, and that the Emperor of Russia had placed at the professor's disposal funds to enable him to perfect his discovery. In consequence of this announcement Mr. Thomas Spencer, of Liverpool, on the 8th of the same month, gave notice to the Liverpool Polytechnic Institution that he should make a communication to them of a process for effecting results similar to those of Professor Jacobi. He afterwards changed his mind with the view of reading his paper at an approaching meeting of the British Association, to which it was communicated for that purpose; but having been overlooked by the secretary, Dr. Dionysius Lardner, it was omitted at the British Association, and was read for the first time at the next meeting of the Liverpool Polytechnic Institution, on the 13th September, 1839. The paper contained a minute account of experiments connected with this subject, in which Mr. Spencer stated that he had been engaged from September, 1837. In one of his experiments he had dropped a little sealing-wax varnish on the copper electrode, and he observed that after a time the whole of it had received a deposit of copper, except those parts which were covered with the varnish. This suggested to him the idea that by covering the whole surface of the copper electrode with bees'-wax, or some other soft cement, and by writing or cutting through the wax with a sharp point, so as to expose the metallic surface beneath, letters or other figures might be deposited upon the plate in relief; and there is no doubt as to the fact, that by actually practising this process, he produced a plate which, with specimens of printing from it, was shown to some of his friends in 1838. On another occasion, not having a slip of copper at hand to form the negative electrode, he happened to make use of a copper coin for the purpose, and on pulling off the deposited metal he found that it exhibited an exact mould of a part of the head and letters of the coin. He was thus led to the idea of forming fac-similes of coins and medals.

This paper was read, as has been stated, in September, 1839. In the following month a letter addressed by M. Jacobi to Mr. Faraday, dated the 21st of June, appeared in the Philosophical Magazine, in which the writer stated that he had been led by a happy accident to the discovery of a method of taking metallic proofs in relief from engraved plates, and that by practising the same process with the proofs themselves, fac-similes of the originals could be produced. He stated that the apparatus which he employed was a simple Daniell battery, in which the ordinary copper electrode was replaced by the engraved plate, or by a copper mould taken from the plate; and he added two important facts then new:—1. That with the current from a simple voltaic pair the sulphate of copper might be reduced in a separate vessel by using two copper electrodes; and, 2. That with this arrangement it was unnecessary to add crystals of the sulphate in order to keep the solution saturated, as this was effected by the gradual oxidation and dissolution of the positive electrode in proportion as the metal deposited itself upon the negative. M. Jacobi remarked also, as Mr. Spencer had done, that not only copper itself, but other metals and alloys might be used to receive the copper deposit.

It is evident that Professor Jacobi and Mr. Spencer are about equally entitled to the merit of having invented that department of electro-metallurgy which is commonly known as the electrotype. It is but just, however, to state that on the 22d May, 1839, Mr. Jordan, a book-printer in London, addressed a letter to the London Mechanics' Magazine, in which he stated that he also had been engaged in experiments in the course of the preceding summer with the view of obtaining impressions from engraved copperplates by the aid of galvanism; and although it appears that he was only partially successful, and had not the leisure or the pecuniary means necessary to prosecute the subject, still as the publication of his letter preceded that of Professor Jacobi's, and even the reading of Mr. Spencer's paper, there is no doubt that he is also entitled to share the credit of the discovery.

The electro-chemical deposition of one metal upon another, and particularly of gold and silver on less precious metals, with a view to their permanent adherence, is quite a distinct department of the art; and although we have seen that this was effected by Brugnatelli in 1805, it was not until 1840 that M. De la Rive, the celebrated Swiss electrician, proposed to employ this method in the arts as a substitute for the old process of gilding. The liquid used by De la Rive was a solution of chloride of gold in very dilute salt water. Immediately afterwards much improved methods, both for gilding and silvering, were patented by Mr. Elkington in England, and by M. de Ruolz in France.

The extraction of silver and other metals from their ores by electro-chemical action was first proposed by M. Becquerel, the elder, in a paper communicated to the French Academy of Sciences in 1836. Lately the proposal of M. Becquerel has found an important application. M. Luckow has devised a process for determining with great rapidity and precision the value of copper ores, by precipitating metallic copper by means of a galvanic current from a nitric acid solution of the ore, and then weighing the metallic copper as such. His method, besides saving time, does away with the necessity for the multitude of complicated operations usually required.

For practising the electrotype on a small scale, a single cell arranged on the principle of Daniell's battery is sufficient, and affords the simplest illustration of the process. Let P, for example, be a porous tube containing dilute sulphuric acid, and a cylinder or slip of zinc z, and let this be introduced into a jar or tumbler filled to the same level as the liquid in the porous tube with a saturated solution of sulphate of copper. In Daniell's battery the outer or containing vessel is generally constructed of copper, and acts as the negative plate; but in electrotyping it must be formed of glass or stoneware, and the place of the negative plate is supplied by the moulds, medals, or other objects, *m*, *m*, intended to receive the deposit. Any number of these may be connected with the zinc plate by wires, as shown in the figure; and as soon as the plate is inserted the action commences. In the course of a few hours a considerable thickness of compact metal will be deposited on the objects suspended in the sulphate of copper solution; and if this deposit be pulled off, it will, of course, exhibit an exact reverse of any impression on the original. To obtain, therefore, any number of fac-similes of the original, it is only necessary to place this reversed copy in the sulphate solution, to serve as a mould for receiving new deposits.

Coins or medals are usually suspended in the solution by means of a copper wire twisted tightly around their edges or circumferences, so as to secure them as in a ring; one face of the object is then covered with wax or gutta-percha, and the other, after being well cleaned, is slightly moistened with sweet-oil, or brushed over with black-lead, to facilitate the removal of the deposit. The annexed figure shows a convenient arrangement for suspending a considerable number of medals in the same vessel, the metallic rim serving as a common conductor for all of them.

It is manifest that a deposit can only take place on a conducting surface capable of acting as the negative plate or electrode of a voltaic combination. The art of the electrotype was, therefore, at first supposed to be limited to metallic objects; but in January, 1840, it was announced by Mr. Robert Murray, at a meeting in the Royal Institution, that non-metallic objects were rendered sufficiently conductive to receive a deposit by simply rubbing them over with black-lead. Of this important discovery it is not too much to say that it far more than doubled the value of the electrotype process. Not only did it bring within the range of the art natural and artificial objects of almost every description, but it furnished the means of expeditiously taking moulds, even from metallic objects, in substances suitable for the purpose. Before the announcement of this discovery moulds could only be taken by impressions in soft metals, or by the tedious and troublesome method of deposition. Mr. Spencer had succeeded to some extent in taking impressions from type in lead, which he afterwards used as the mould; but this method, imperfect at best, was evidently quite unsuitable for objects in high relief, or incapable of sustaining a very severe pressure. Metallic moulds were afterwards formed with much greater success by taking impressions in clechée—that is to say, by means of fusible metal in a semi-liquid state. Either of the following alloys may be used for this purpose:—

Tin.	Lead.	Bismuth.	Zinc.
4	1	0	0
1	1	2	0
1	2	3	0
1	0	1	1
5	10	1	0

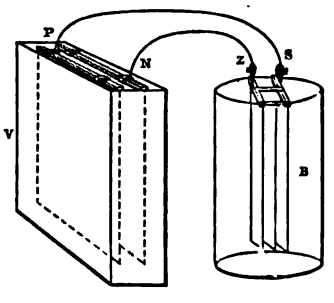
Whichever of these compositions be used, the ingredients are melted and thoroughly mixed together in an iron ladle. The medal or coin to be copied is brushed over with a little sweet-oil, and bound round the edge with a slip of tin or card. The alloy, in a state of fusion, is then poured into a small tray, and when it begins to *set*, or is just on the point of solidifying, the operator brings the medal suddenly upon it, face downwards. This is a process which requires considerable skill and practice to be successfully managed, and scarcely admits of application, except to the amateur business of copying coins and medals. On the contrary, by the use of plumbago, every substance that is capable of receiving an impression is rendered suitable for electro-chemical deposition. Wax, stearic acid, compositions of wax and rosin, plaster of Paris, and gutta-percha, are now extensively used for this purpose in the arts. The last-mentioned substance, in a state of purity, is found to be peculiarly suitable for taking fine impressions; it is easily softened by heat, becomes very firm and solid when cold, and possesses the valuable property that it is not acted upon by acids. It also readily takes on the black-lead. Moulds of plaster of Paris are prepared with the finest material, mixed with sufficient water to give it the consistence of thick cream. In this form it is poured upon the face of the object to be copied, and when it has sufficiently consolidated to be removed with safety, it is thoroughly dried at the fire, and afterwards saturated with wax at the impressed surface. On receiving a coating of plumbago it is ready for use. Bees'-wax, with or without stearine, is prepared for moulds by melting it over a slow fire, then stirring into it a little white-lead, and afterwards re-melting the mixture two or three times. It is then poured out upon a tray, and when it has acquired sufficient consistency the wood-cut or other object to be copied is placed upon it face downward, and subjected to powerful pressure. If the process has been well managed the impression will be perfect; and when placed in a metallic frame, and coated with plumbago over the impressed surface and part of the frame, it is ready to receive the copper deposit. Mr. Gore recommends, as an excellent composition for moulds, a mixture consisting of two parts of gutta-percha and one part of Jeffrey's marine glue. The latter, in small pieces, is melted at a gentle heat in an iron ladle; the gutta-percha, also in minute fragments, is then added, and the whole stirred until thoroughly incorporated. When gutta-percha is used alone it may be simply heated in boiling water till quite soft, and an impression from small objects can then be taken upon it by means of a copying-press.

For taking moulds of busts, statuettes, or other ornamental or natural objects which do not present a flat surface, Mr. Parkes of Birmingham patented an elastic composition, similar to that used by letter-press printers for their inking-rollers, and consisting of a mixture of glue and treacle, in the proportion of 4 lbs. of the former to 1 of the latter. The object from which a mould is to be taken, if a plaster bust, is well oiled, and introduced into a smooth cylindrical vessel of sufficient depth to allow the object to be more than covered by the composition. The vessel is also oiled; and when the composition has been poured in and allowed to cool, the whole is easily taken out by inverting the vessel upon a table. The mould is then cut up the back with a sharp knife, and held open while an assistant lifts out the bust, after which it is allowed to re-close, and tied round to keep it firm. The interior is now a perfect mould of the object; and though it cannot be inserted directly in any electrotype solution, being composed of a highly soluble material, it furnishes the means of preparing any number of casts or fac-similes of the model in materials suitable for that purpose. A mixture of wax and rosin, with occasionally a little suet or stearine, is generally used, and is poured into the mould after being allowed to cool down till it just retains its fluidity, so as not to melt the mould. A number of wax models of the bust or other figure may thus be obtained, and these, being covered with plumbago, may be employed to receive a copper deposit, from which, when sufficiently thick, the wax can be melted out, and the interior is then prepared, by washing it with alcohol and acids, for receiving a deposit of one of the precious metals. A perfect fac-simile of the model is thus obtained in silver or gold, and finally the copper shell is dissolved off by acids, which do not attack the nobler metals.

Mr. Parkes patented also a process for imparting a conducting power to the surface of objects so complex, or so much undercut, that black-lead cannot be conveniently applied. Three liquids are required for

this purpose, respectively termed the phosphorus solution, the silvering liquid, and the gilding liquid. To prepare the phosphorus solution, 64 grains of wax or tallow are melted, then 8 grains of finely-cut caoutchouc are dissolved in 160 grains of bisulphide of carbon, to which the melted wax or tallow is added, and the mixture well shaken; 64 grains of phosphorus are now dissolved in 960 grains of the bisulphide, and the resulting solution thoroughly mixed with the previous one. The model or mould, after a number of fine guiding wires have been carried from the main connecting wire into all the hollow and distant parts of its surface, is dipped into this solution for one minute. When dry it is immersed in the silvering liquid, which is made by dissolving 18 grains of pure silver in about 20 grains of nitric acid, and diluting with 20 ounces of distilled water. In one or two minutes, when the surface appears like black china, it is taken out and washed, by pouring distilled water over it. It is then treated in a similar way with the gilding liquid, which is made by dissolving 5½ grains of pure gold in about 22 grains of aqua regia, and diluting with 20 ounces of distilled water. This solution gives the mould a yellowish bronze appearance, and after being washed it is ready to receive a deposit of copper, or any other metal. Either the silvering or gilding liquid may be used separately with good effect, but the best results are obtained by dipping the object in both solutions. This process is chiefly applied when a permanent coating of gold, silver, or any other metal is to be deposited upon the model.

In the processes of electro-gilding and silvering, and in all electro-metallurgical operations conducted on a pretty large scale, a separate battery is generally used, which may be either a Daniell's, a Smee's, or a Wollaston's (see GALVANISM). Grove's and Bunsen's batteries are seldom used in these operations, on account of the disagreeable fumes which they generate. To illustrate the separate cell arrangement, let us suppose that we have to take a cast in copper upon an engraved plate of the same metal, or on any plumbagoed surface. A solution of sulphate of copper is introduced into any convenient vessel, V, across which are placed two metallic rods; and supposing B to be a cell of Smee's battery, one of the rods P is connected with the silver plate of the battery by the wire S, and the other rod N with the zinc plates by the wire Z. If a plate of copper be now suspended from the rod P, and the object intended to receive the deposit from the rod N, the battery circuit will be completed through the liquid in the vessel V, and the current will proceed in the



direction S P N Z, passing from P to N through the sulphate of copper solution. In doing so the water contained in that solution is decomposed; its oxygen unites with the copper plate or positive electrode P, and its hydrogen unites with the oxygen of the oxide of copper in the sulphate, so that the metal is set free and is deposited upon the negative electrode. The action is precisely the same as in Daniell's battery, except that the sulphuric acid which is disengaged by the deposition of the copper unites in this case with the oxide of copper formed at the positive electrode, keeping up a constant reproduction of the sulphate of that metal exactly in proportion as it is reduced at the surface of the negative electrode. If a plate of silver, or even of platinum, were used for the positive electrode, copper would still be reduced upon the plate suspended at N, but in that case it would be necessary to keep up the strength of the solution by adding, from time to time, fresh crystals of the sulphate, as in using the single cell; but when a plate of copper is suspended at P this addition is unnecessary, however long the process may be continued; and generally, whatever metal is being deposited, a plate of the same metal should always be used for the positive electrode. Zinc, for example, may be deposited from a solution of the sulphate of that metal; but if the positive electrode were of copper, the first portion of zinc deposited would convert the decomposition trough V into an active voltaic arrangement, having its poles in the reverse order of those of the working battery, and a contrary current would be set up, which would greatly diminish, if it did not entirely overpower, the force of the battery current.

We have stated that this separate battery arrangement is generally used in the processes of electro-gilding and silvering, which we shall now briefly describe. Gilding on metals was formerly performed by amalgamation, a mixture of finely-divided gold and mercury being rubbed over the object, and the mercury afterwards driven off by heat. This process was very detrimental to the health of the workman, as the fumes of mercury are extremely poisonous. 'The old authors,' says Mr. Smee, 'draw most dismal pictures of the horrors of mercurial inhalations, and not without cause; for it is not at all uncommon for the medical man to witness salivation, universal trembling of all the limbs, nervousness, nay, even death itself, from this powerful agent.' In silver-plating the method formerly used, and still practised to some extent, consists in soldering a piece of silver upon a bar of copper, and subjecting the metals thus united to the dilating process of heavy rollers. By this process, as the two metals extend equally, the silver, being very ductile, is reduced to an exceedingly thin covering. The plated metal is then manufactured into the required forms, and the different parts of complex vessels, or other utensils or ornaments, soldered together. It is evident, indeed, that articles could only be plated by this process *before* being manufactured into the required shape, and that this imposed heavy restrictions on taste and design, compared with the entire freedom and facility of merely depositing gold or silver by electrical agency on articles already manufactured. It is worthy of remark, also, that when worn through in any part, articles plated by the old method were valueless, before the introduction of the electro-process.

For electro-gilding, the auro-cyanide of potassium makes the best solution. It may be prepared by dissolving gold in three parts of hydrochloric (muriatic) acid and one of nitric acid, which forms the chloride of gold. This is digested in calcined magnesia, and the gold is precipitated as an oxide, which is boiled in strong nitric acid to dissolve any magnesia in union with it. The oxide, being then well washed, is dissolved in cyanide of potassium, which gives the auro-cyanide of that metal, or, in other words, a cyanide of gold and potassium.

For silver-plating the argento-cyanide of potassium is the best solution, and may be formed in much the

same manner as the auro-cyanide. In the first place metallic silver in fragments is dissolved, with gentle heat, in four parts of nitric acid, diluted with one part of water. The solution of nitrate of silver thus formed is further diluted with ten parts water, and dissolved cyanide of potassium is then added, so long as a white precipitate falls. This precipitate is cyanide of silver. When it has sufficiently settled down the clear liquor is carefully decanted, and, after the precipitate has been well washed to remove the soluble salts, a solution of cyanide of potassium is added to it until it is completely dissolved. The resulting liquid constitutes the argento-cyanide of potassium, which forms the silvering solution.

Another and preferable method of preparing both the gilding and silvering liquids consists in employing the battery current itself to dissolve the required amount of gold or silver in the cyanide of potassium solution. For this purpose, as much of the latter as is intended to be used is made of the strength of one and a quarter ounce of the salt to the gallon of water. A porous cell is then introduced into this solution, and is filled to the same level with the same liquid. A plate of copper or iron is put into the porous cell, and connected with the zinc terminal of the battery; in the outer solution is put a sheet of gold or silver, according as the object is to obtain the auro-cyanide or the argento-cyanide, and this is connected with the copper terminal of the battery. The required quantity of gold or silver will be dissolved in the liquid in the outer vessel in the course of a few hours. By weighing the sheet of the precious metal before and after the operation, the quantity that has been dissolved will be ascertained. For silver, the solution should contain at least one ounce of that metal to the gallon; and for gilding, from one-half to an ounce of gold in the gallon. There is no other difference between the processes for the two metals, except that in preparing the gold solution, and for all the operations of gilding in which it is used, the liquid must be heated to at least 130° Fahrenheit—a precaution which is not necessary in preparing or operating with the silver solution.

The process of gilding is generally performed upon silver articles; and these, before being gilt, merely require to be well brushed, and then kept in clean water until they are immersed in the depositing solution. In gilding iron, tin, or lead, it is usual to deposit a slight film of copper upon these metals before introducing them into the auriferous bath. The metals best adapted for silver-plating are copper, brass, and particularly German silver. The latter composition is now generally used for all new work. In plating and gilding a principal object is to render the deposited metal as fixed as possible; and with this view it is necessary to remove from the surface intended to receive the deposit every particle of grease and oxide. This is sometimes done by simply scouring the articles with sand or emery paper, or with very fine pumice-stone powder applied by means of scratch-brushes; but generally the articles are prepared for silver-plating by being first boiled in a strong ley of caustic potash or soda, and then dipped into nitric acid, diluted to such an extent as to act very slightly upon the metal; they are then scoured with a hard brush and very fine sand, and after being washed thoroughly and dried they are carefully weighed. The article to be plated is then dipped into a mixture of sulphuric and nitric acids, technically termed *pickle;* after which it is again washed by immersion in distilled water, and then quickly dipped in a solution of nitrate of mercury until it appears white on the surface; finally, it is suspended in the silver solution by the wire connected with the zinc pole of the battery, when it is immediately coated with a thin film of silver. This operation is termed *striking*. After a few seconds it is taken out and well brushed, generally with bundles of brass wire attached to a lathe; it is then washed and replaced in the plating solution, where it is allowed to remain for a longer or shorter period according to the battery-power employed, the strength of the solution, and the thickness of deposit required. Generally an immersion of a few hours is sufficient for the purposes of commerce. To ascertain the amount of metal deposited it is only necessary to reweigh the articles after the operation, or even during its progress. One and a quarter to one and a half ounce of silver to the square foot of surface gives an excellent plate about the thickness of common writing paper.

In ordinary circumstances the coating of deposited silver is chalk white, and has a dead or matted appearance, which is much esteemed for medals. Sometimes the operator is desirous of having his object bright, either entirely or partially, so that the bright and dead parts may form a contrast with each other. In this case the object is brushed over with old ale or beer, or dipped into a solution of soft soap, to which, in the case of gold, a little prussic acid is added, and then it is submitted to the burnisher. There is a method, however, by which the silver may actually be thrown down with a metallic lustre. This consists in adding to the silver solution a little bisulphide of carbon, collodion, or sulphur. Sesquichloride of sulphur and the hyposulphite of either potash or soda may also be used for the same purpose; and a solution of iodine and gutta-percha in chloroform is said to be more permanent in its effect than bisulphide of carbon, but the latter is most generally used.

Some of the vats used for silver plating are 6 feet in length by 30 inches in breadth and depth, and contain from 200 to 250 gallons of liquid: but for the gilding solution the troughs are generally much smaller, and are fitted with steam-jackets to keep them at the required temperature.

When the articles to be gilt have been cleaned and dried they are weighed, and one immersion is given, of merely sufficient duration to impart a blush of gold. They are then taken out, brushed, and re-immersed. If the battery and solution are in good order three or four minutes will suffice to gild any small article. When gilt it is again weighed, and the quantity of gold deposited is thus ascertained. When the power of the battery is properly adjusted to the strength of the solution the deposited gold should be of a dark brownish yellow, and this when burnished will yield a beautiful rich deep colour. If, on the contrary, the battery be too strong, the colour of the gold when taken out will be black; and if the battery be rather weak, and the solution too cold, the deposit will be light-coloured.

Besides gold, silver, and copper, the deposition of other metals by the electro-chemical process has not hitherto been attended with much advantage, and to enter into minute details on the subject would be a waste of time. The depositing liquid employed for electro-zincing is made by dissolving 2 lbs. of sulphate of zinc in a gallon of water, and to work the solution a separate battery and a zinc electrode are necessary; but iron and other metals are much more easily and economically coated with zinc by the method improperly known as *galvanizing*, which consists in immersing them in a bath of the melted metal. Mr. Smee states that iron may be deposited from a solution of the protosulphate of that metal by connecting the object upon which the deposit is to be effected with the zinc of the battery, whilst an iron nail is connected with the silver or copper pole. He adds, that as the source of power a relatively small single

cell will suffice, and that the reduced metal is brighter and rather whiter than polished steel, but soon tarnishes in the air. The deposition of this metal may appear a superfluous operation, but it has proved useful for giving a hard surface to copper duplicates of steel plates.

It cannot be doubted that at present one of the most important applications of this art is to the purposes of printing and engraving. In large printing establishments it was lately a common practice to give an increased durability to stereotype plates by depositing on them a film of copper. Instead of this a duplicate in copper is now taken from the page of type by means of a mould of wax or other plastic substance, and afterwards giving the requisite thickness to the plate with the softer stereotype metal—a plan applicable with even better results to engravings on wood. Another somewhat similar application of the art is the multiplication of engraved steel or copper plates. This is accomplished by taking a copper deposit from the original plate, to be used as a mould for producing the plate for the printer.. It was with a view to the accomplishment of this important object that the art may be said to have been invented; and though it long failed, it has latterly been very successful, and promises to be still more serviceable in various similar applications.

ELECTROMETER. An electrometer is an instrument for measuring differences of electric potential between two conductors through effects of electrostatic force, and is distinguished from the galvanometer, which, of whatever species, measures differences of electric potential through electro-magnetic effects of electric currents produced by them.[1] In the report from which the above definition is quoted a list of eleven different electrometers is given: some of them are of very imperfect construction, and rather come under the name electroscope than under the name electrometer. The reader is referred for full information to that report. All that we can do here is to indicate the *principles* on which one or two of the most important forms of electrometer are constructed.

The inventions of Sir William Thomson have brought electrostatic measurement to a state of great perfection. Besides his electrometers, and Coulomb's torsion balance, which will be found described elsewhere (see TORSION BALANCE), we only mention here two instruments of importance, Peltier's electrometer and Delmann's electrometer. Neither of them, however, requires description: they are completely superseded by those about to be explained.

1. *The Absolute Electrometer.*—If two flat parallel plates of infinite extent are attracting each other on account of a difference in their electrification, and if we know the force of attraction exerted by one on the other per unit of area of its surface, and the distance between the plates, we can calculate the difference of potentials between them. This is the principle made use of in the absolute electrometer. It is not possible to employ infinite plates; but it can be shown that if the distance between the plates is very small in comparison with their length and breadth, and if the force of attraction is not estimated by means of points near the edges, the result is practically the same as if the plates were infinite. The absolute electrometer consists essentially of two flat circular horizontal plates, the lower of which is insulated and can be electrified, and which can also be moved up or down—that is, nearer or farther from the other. The second plate, which is connected with the earth, is much smaller than the first. It is hung by a spring, and when it is attracted by the other plate is drawn downwards. When an experiment is being made, the lower plate, which we suppose electrified, is moved up or down till it is in such a position that the upper plate is drawn down to a position exactly marked, which we may call the standard position. By means of previous experiments, made by putting small weights on the upper plate, it is determined exactly what force is necessary, acting against the spring, to draw down the plate to this position. Hence the force of attraction exerted by the lower plate is known, and the distance between the plates is read off on a scale. The difference of potentials between the plates can be calculated from these data. We have remarked above that the force of attraction must not be measured by means of points near to the edges of the plates. The upper plate, the attraction on which is estimated, is therefore, as we have already mentioned, made much smaller than the lower plate; and it is surrounded by a broad flat ring, called the *guard ring*, which is fixed, but which, when the plate is in the standard position, is precisely in the same plane with it. The plate is thus a movable part in the middle of the plane which it and the guard ring together form.

2. The *Portable Electrometer.*—In this instrument there are two flat circular parallel plates, of which the lower one is kept permanently electrified to a constant potential by means of a Leyden jar arrangement. In the centre of this plate is cut a square hole, in which there is suspended a thin square of sheet aluminium, precisely on the principle of the common machine for weighing carts, except that instead of levers and weights the torsion of a fine platinum spring, on which the aluminium plate is suspended, is the force against which the attraction on the plate is exerted. A light index arm, attached to the plate, stretches out to the circumference of the brass plate, and its position shows with great exactness when the aluminium plate is in its standard position. The upper plate of the instrument is movable, and can be brought nearer or withdrawn from the lower plate, and by a scale the distance between them is read off. It is insulated, but a wire attached to it can be connected with any electrified body, or with the earth. To use the instrument, this wire is first connected with the earth, and the upper plate is moved up or down till the index is in the standard position. The *earth reading* is then taken. The wire is now connected with the body to be tested, and a second reading is taken as before. The difference of these gives *the difference of potentials between the earth and the body tested, in terms of the scale of the instrument.* To reduce such readings to *absolute measure* a previous experiment must be made for comparing the instrument with the absolute electrometer, or with one the values of whose indications in absolute measure are known.

3. *The Quadrant Electrometer.*—The movable part of this instrument consists of a very light 'needle,' or rather plate, shaped like a canoe paddle, of thin sheet aluminium, which is supported by a bifilar suspension, and turns in a horizontal plane. It is connected with a Leyden jar, which forms part of the instrument; and the Leyden jar is kept at a constant potential by means of a small electric machine founded on electrostatic induction, and called the 'replenisher.' A light mirror, as large as a three-penny piece, is attached vertically to the needle, and turns with it, just as in the case of the *mirror galvanometer.* Opposite the instrument is placed a horizontal scale, with a slit or hole in the middle of it. A lamp placed behind this slit sends a ray of light to the mirror, which it reflects back to the scale, and the position of the light on the scale indicates the angle, if any, through

[1] The definition here given is quoted from Sir William Thomson's Report to the British Association (1867) on Electrometers and Electrostatic Measurements.

which the mirror and needle have turned from a standard position. This completes the testing part of the instrument, and the index.

The needle is surrounded by a hollow cylindrical box of brass. The box is divided into four quadrants, each of which is insulated by being supported on a glass stem; and the suspension of the needle passes down through a hole at the middle of the top of the box, while a wire carrying a weight that is attached to the centre of the needle passes down through a similar hole in the bottom of the box. The opposite pairs of the quadrants are connected together; and from each pair of quadrants an electrode proceeds to the outside of the instrument, which is otherwise completely inclosed from the air to preserve the insulation of its parts. Let us suppose, now, that the Leyden jar, and therefore the needle, is electrified positively, and that one pair of quadrants is connected with the earth, while the other pair are connected by means of their electrode to the body to be tested. If the body is positively electrified the pair of quadrants connected with it will repel the needle at both ends, and it will therefore turn round so as to be under the pair of quadrants connected with the earth; but if the body tested be negative the needle will be attracted. The needle turning, and carrying with it the mirror, the spot of light will be seen to move along the scale, and will take up a position depending on the intensity of the attraction or repulsion as compared with the torsion of the bifilar suspension of the needle. The indications of this instrument are, as in the case of the portable electrometer, to be compared with an absolute instrument, either directly or indirectly, in order to reduce them to absolute measure.

ELECTROPHORUS (Greek, *pherō*, to bear), an instrument for obtaining electricity by means of electrostatic induction. The instrument is shown in fig. 1, Pl. LI. A circular tin dish of convenient dimensions is filled with some resinous mixture; one of the best consists of equal parts of resin, shell-lac, and Venetian turpentine. The materials are melted together and poured hot into the mould or *form*. The cake may be from ½ to ¾ inch thick. This is called the *sole* of the electrophorus: it is now often made of a flat circular plate of ebonite, the under side of which is covered with tin-foil. A flat plate of brass, B, with well-rounded edges, very nearly covers the sole, and a glass handle for lifting the plate B is cemented into the cap C.

To obtain electricity by means of the electrophorus, the resinous plate, or sole, is excited by rubbing it and striking it briskly with warm dry flannel or cat-skin. It thus becomes negatively electrified. The brass plate is now set down on the sole and touched with the finger. On approaching the finger a slight spark is seen to pass, and when the brass plate is raised by means of the glass handle, which should previously be well dried, it is found to possess a charge of positive electricity. Being discharged it may be set down again on the resinous plate, touched with the finger, and again raised; and this may be done many times, and a charge of positive electricity obtained each time, without the necessity of exciting the resinous plate again. Also, if the brass plate be set down on the sole, the instrument may be put away in a dry place for weeks, and will frequently be found ready for use without requiring to be excited afresh.

The following is the theory of the instrument:—The brass plate, when set down on the sole, touches it only in a few points, owing to the rigidity and the unevenness of both plates. If it were then lifted, it would be found to carry away from these points a faint charge of negative electricity. But the greater part of it being not in actual contact with, but only in close proximity to, the remainder of the resinous plate, which is negative, the brass plate becomes excited by induction, and when the finger is brought near, negative electricity passes from the brass plate to it (just as in the elementary experiments on electrostatic induction), positive electricity being held attracted by the negative electricity of the resinous plate. When the brass plate is raised, the positive electricity is set free, and is ready to be discharged. The use of the metal form, or the tin-foil pasted below the ebonite, is to admit of perfectly free charge and discharge of the lower surface of the resinous plate, when the brass plate is lifted and set down. For many purposes the electrophorus is a very convenient instrument, being both simple and portable.

Of late instruments have been constructed acting by induction, to which the name rotatory electrophorus has been given. Among these is the machine of Bertsch. Its construction is, briefly, the following: A large circular plate of ebonite is capable of being revolved rapidly. Opposite one section of the plate is placed a fixed plate of the same material, called the *inductor*, which, to begin with, is excited by friction: and on the opposite side of the revolving plate, facing the inductor, there is a metallic comb, similar to that of a common electric machine. This comb is connected with the earth: and it will readily be understood that the revolving plate, when it is turned between the comb and the inductor, becomes positively electrified on the side near to the comb, while negative electricity passes from the comb to the earth. A second comb fixed opposite another section of the revolving plate receives positive electricity from it as the electrified portions of the plate come round.

ELECTROSCOPE (Greek, *skopeō*, to look), an instrument for detecting the existence of an electric charge, and generally also for determining whether it is positive or negative. The name electrometer is given to instruments whose object is to measure the extent of the electrical disturbance, but these instruments may, of course, be used for detecting its existence also. Here we shall only describe one or two forms of the electroscope proper.

One of the most elementary kinds is shown in fig. 4, Pl. LI., connected by a chain to the Leyden jar. It consists of two small balls of rush or elder pith, *a*, *a*, attached to fine wires or threads (if threads, they must be conductors). The wires or threads are carried by the brass hook *b*, which is supported on a glass stem fixed into the foot *c*. A charge of electricity coming, let us say from the outside of the jar along the chain *d*, electrifies the balls *a*, *a* as well as the wires by which they hang: and being similarly electrified, they repel each other and stand apart, as shown in the figure. This is the oldest kind of electroscope: it (or rather a pair of straws hanging down) was used by Beccaria, Volta, and others early last century. It is quite superseded by—

Bennet's Gold-leaf Electroscope, introduced in 1789. This instrument, as improved by Volta (see below), is shown in fig. 8, Pl. LI. In it Beccaria's pair of straws are replaced by a pair of gold leaves, which, when the instrument is uncharged, hang down in contact. They are shown diverging under the influence of a charge in the figure. They are attached to a ⊥ piece of brass, the upper part of which is connected with the circular plate on which, in the figure, a second metallic plate, with a glass handle attached, is resting. The whole is supported by a dome-shaped glass, through which the upper stem of the ⊥ piece passes, and the dome is covered with a coating of shell-lac or sealing-wax to improve the insulating power of the glass. The dome-shaped glass is supported on a wooden frame and surrounded by a cubi-

cal box of glass: and the instrument is completed by two upright pillars of brass, between which the gold leaves hang down. The upper circular plate to which the glass handle is attached is Volta's addition. Leaving it out of account for the moment, and supposing it removed, the gold-leaf electroscope is used in the following way:—A body to be tested is brought *near to* the plate of the instrument. If it is electrified, electricity of the kind similar to that with which it is charged will be driven by induction towards the gold leaves, which will therefore diverge by mutual repulsion. This is sufficient for a test of electrification of the body presented. If it be desired to determine the kind of electricity with which it is charged, the plate of the instrument is touched with the finger when the body to be tested is near to it. Being thus put in connection with the earth, while at the same time it is under inductive influence from the charged body, electricity similar to that of the charged body passes away through the hand, and the gold leaves fall together again. Removing the finger the electroscope is left charged with the opposite kind of electricity, which, however, is held *bound*, as it is sometimes called, by the attraction of the body that is still near to it. But let this now be removed, and the charge, set free, spreads itself over the gold leaves and causes them to diverge. We have now to determine what kind of electricity the electroscope is charged with, recollecting that the body tested is charged with the *opposite* kind. To do this we electrify a stick of sealing-wax and also a rod of glass, and bring them, first one and then the other, near to the plate of the instrument. One of them will make the leaves diverge more by driving more electricity of the same sort towards the gold leaves: the other, by attracting some of the electricity which they possess, will cause them to fall together. It is evident that the instrument is charged with electricity similar to that which gives the leaves an increased divergence, and the body tested was therefore charged with the opposite kind.

Volta's Condensing Electroscope is similar to that just described, but the brass plate connected with the gold leaves is covered with a coat of shell-lac varnish, and on this rests the upper plate, which we may call the condensing plate, shown in the figure, and which is removable by means of the glass handle. This is in fact an Epinus' condenser attached to the gold leaves, and has the effect of increasing the capacity of the plate of the instrument while the condensing plate is present. The use of the condenser will be readily understood from the description of Epinus' Condenser under INDUCTION (ELECTROSTATIC).

The *Single Gold-leaf Electroscope*.—In this instrument a single gold-leaf, supported as in the instrument just described, hangs down between two metallic plates which are supported on horizontal wires that pass through the sides of the dome-shaped glass in the figure. They are held fixed by passing through corks that fit into holes pierced in the glass, and they are thus insulated from the ground. The ends of the wires outside the glass are furnished with binding-screws, and to these may be attached the electrodes from a galvanic-battery, and the plates on the two sides of the gold-leaf are thus kept, one of them positively, and the other negatively electrified. Suppose the gold-leaf now to receive a slight charge, either positive or negative, it is attracted by one plate and repelled by the other, and it tends towards the side whose electrification is opposite to its own. The instrument may be rendered as delicate as we please by bringing the plates very near to the gold-leaf, and by increasing their electrification.

Bohnenberger's Electroscope is similar to that just described, except that, instead of the plates kept electrified by a battery, it is furnished with two *dry piles*, which stand vertically, one on each side of the gold-leaf, the positive pole of one, and the negative pole of the other being uppermost. Their opposite poles are connected together by the sole of the instrument. It is also usually furnished with Volta's condensing plate. The latter two instruments are now rarely employed.

ELECTROSTATICS is the part of the science of electricity that treats of the phenomena of electricity at rest. The terms *electrokinetics* and *electrokinematics* (see DYNAMICS for an explanation of these terms) are also employed by the most philosophical writers on electricity; but they cannot be said to be at present in *popular* usage. We have already considered a portion of the subjects that might fall under *electrostatics* in our article ELECTRICITY: and according to the plan of this work other matters that might in a consecutive treatise come under the name will be found under INDUCTION (ELECTROSTATIC), CAPACITY (SPECIFIC INDUCTIVE), ELECTRIC MACHINE, &c. Here we propose to give a brief account of the mathematical laws of electric attraction and repulsion, and the distribution of electricity in conductors, together with some remarks that will indicate where additional information on the mathematical theory of electricity at rest may be found.

The elementary experiments described at the beginning of our article on ELECTRICITY give us, as is there remarked, the following general law, that similarly electrified bodies repel each other, and dissimilarly electrified bodies attract each other. An electrified body of either kind also attracts a neutral, that is, unelectrified, conductor, such, for example, as the gilt pith-ball described in that article: and this, taking the fact along with our knowledge of induction, we readily see is because by induction the opposite kind of electricity to that of the attracting body is drawn to the nearer side of the neutral body, and is more powerfully attracted on account of its greater proximity than is repelled the equal quantity of electricity similar to that of the attracting body.

The exact quantitative laws of electric attraction and repulsion were first investigated by Coulomb. His experimental and mathematical genius left nothing to add to them or to alter: and, though for a time their accuracy was doubted on account of misleading experiments made in the first half of this century, they are now admitted to be at least as rigorously true as the law of gravitation. Coulomb's investigations were carried on with the assistance of his *torsion balance*, which is shown, figs. 12, 15, Pl. LI., and a full description of which will be found under that name. Essentially its construction is as follows: A light horizontal arm, *f*, carries a gilt pith-ball, *g*, at one end, and a counterpoise at the other. It is suspended by a fibre of glass, or a fine wire, which is attached to the torsion head, D, shown in section, fig. 12. The vertical arm *f*, which is also made of insulating material, supports a second gilt ball, *g*, precisely similar to the first. The second ball is removable, and can receive an electric charge, which in the position in which the balls are represented in the figure it immediately divides with the other ball. Repulsion ensues, and the force of repulsion is tested against the torsion of the fibre. Attractive forces are examined by first charging the ball *g* on the horizontal torsion arm with, let us say, positive electricity, and then turning the torsion head, fig. 12, till the ball is at the opposite side of the glass case from that at which it is shown in the figure. The ball *g* on the vertical support is now introduced into the case charged with negative electricity, and the attraction of the two balls is observed by means of the torsion of the suspending fibre. To determine

the law according to which quantity of electricity influences attraction and repulsion it is necessary to be able to vary the charges on the balls in some determinate manner. For this purpose Coulomb used a third ball equal and similar to the other two. When two equal balls, one of them charged, are put in contact, the charge divides itself *equally* between them. Thus by successive contacts with one or both of the balls, always discharging the third ball, he was able to subdivide the charges on them to any extent required.

Experimenting in the way here indicated, and making use of precautions exquisite in their refinement, Coulomb arrived at the following beautifully simple laws:—

1. The force of attraction or repulsion between two electrified points is proportional to the product of the numbers that express the quantities of electricity at the points.

2. The force of attraction or repulsion between two electrified points is inversely proportional to the square of the distance between the points.

The unit of quantity used in electrostatic measurements (see UNITS, ELECTRICAL) is the quantity which, placed at unit distance from an equal quantity, attracts it or repels it with unit force.[1] Hence multiplying together the numbers that express the quantities of electricity on the balls, and dividing by the square of the distance between their centres,[2] we obtain a number which expresses the force of attraction between them. The two laws are thus expressed by the following simple formula. Let F be the force of attraction or repulsion, and let Q, Q′ be the quantities of electricity on the balls, while D is the distance between their centres; then—

$$F = \frac{Q \times Q'}{D^2};$$

and if to the symbols Q, Q′ the signs + and − be prefixed according as the charges on the respective balls is positive or negative, we shall evidently have repulsion or attraction between the balls according as the sign of F is positive or negative.

As we have already mentioned, our knowledge of the laws of electric force are primarily due to the genius, experimental and mathematical, of Coulomb. His direct method is very remarkable; for no other investigator has advanced our knowledge by the direct method beyond the point to which he brought it: and, as far as the truth of the fundamental laws is concerned, the only advance that has been made since his time is the establishing of them by an indirect method, susceptible of a greater degree of experimental accuracy. This may be briefly explained in the following way:—Assuming the laws stated above as strictly exact, we may deduce by mathematical reasoning a certain proposition with regard to the *distribution* of electricity on conductors, which is very easily put to the test. The proposition may be stated as follows, viz.: *If the law of the inverse square of the distance holds exactly, then the whole of the electricity on a charged conductor must reside strictly at the surface of the conductor.* This hypothetical proposition is due to Cavendish. He was not in the position to test experimentally whether the whole of the electricity does reside at the surface of the conductor, or at least his exact mind was not satisfied with the tests at his disposal. But the most delicate tests that modern refinement has been able to apply have shown no deviation whatever from the truth of the hypothesis; and our evidence for the exactness of the law is as precise as our evidence for the exactness of the law of gravitation.

We have already stated the fundamental law of the distribution of electricity on conductors. A multitude of experiments may be given in proof and illustration of it. We mention here a beautiful experiment due to Faraday, and known as the 'ice-pail experiment.' Let an ordinary ice-pail be insulated, and connected with a delicate gold-leaf electroscope; and let a metallic ball, suspended by a silk thread, be charged and lowered into it. The gold leaves will be seen to diverge on account of induction; but when the ball is raised from the interior they will be seen to fall together again, and the ball will be found to possess its electrical charge. But let the ball be lowered down till it touches the bottom, and then raised out of the ice-pail. It will be found to have communicated its charge to the ice-pail, and the leaves will have a permanent divergence. Let the electroscope now be discharged, and let the ball be tested with it, and it will be found completely diselectrified, not having carried with it the faintest charge from the interior of the ice-pail. Moreover, if two equal spheres are taken, one of them of solid metal and the other of glass or other non-conducting material covered with the finest gold-leaf, and if one of them is charged and touched with the other the charge divides itself between them, and no electrostatic test that we can apply, though our modern instruments furnish us with tests of extreme delicacy, will enable us to distinguish between the quantities of electricity possessed by the two.

When a conducting *sphere* is electrified the charge is uniformly distributed over the surface; but with conductors of other forms this is not the case, and a slight examination will convince us that the distribution depends on the form of the surface. Coulomb, testing with his *proof-plane* (which see), showed that the *electricity is collected on the more outlying portions of the conductor*. Thus, in an elongated cylinder, or in an egg-shaped body, the greater part of the electricity is to be found at the ends, and but little in the middle of it. The quantitative investigation of the distribution of electricity on conductors was undertaken by Coulomb in several cases, and the complete agreement of the results of his experiments with the results of the mathematical investigations of Poisson form a beautiful confirmation of his experiments on the one hand, and on the other of the laws stated above on which the investigations of Poisson were founded.

It is impossible here to give a more complete account of the results of these investigations. The subject is beset with difficulties both to the experimenter and to the mathematician. A few cases have been examined—for example, the cases of a cylinder, of an ellipsoid of revolution, and of two spheres, which may be of unequal radii, in contact with each other. The chief investigators of the subject are Coulomb, Cavendish, and Faraday among experimentalists; and Poisson, Green, Charles, Liouville, Thomson, among mathematicians. The papers of Thomson published in the Cambridge and Dublin Mathematical Journal, and in the Philosophical Magazine, and reprinted collectively (1872), may be consulted for a full exposition of all that has been done in the mathematical theory of electricity.

[1] The derivation of electrical units, and their relations with the fundamental units of time, space, and mass are fully considered under UNITS (ELECTRICAL). It is enough to say here that the *absolute* or *kinetic unit* of force is to be understood in the text. It may here be defined specifically as the force which, acting freely on a mass of one gramme for a second, would generate in it a velocity of one centimetre per second.

[2] It is here assumed, and it may be proved to be true, that the repulsion or attraction between the two balls is the same as if the whole electricity that they possess were concentrated at centres of the balls.

ELECTRO-TINT, an art by which drawings are traced by the action of electricity on a copper plate. The surface of the plate is sunk, and the drawings are produced in a fine tint in relief, for use in the common printing-press.

ELECTROTYPE. See ELECTRO-METALLURGY.

ELECTRUM (Greek, *ēlektron*), a substance first mentioned by Homer, with regard to the nature of which there has been much discussion, some maintaining that it was amber, others that it was an alloy of gold and silver. The following is the most recently advanced opinion. The term *ēlektron* originally meant gold, just like *chrusos;* but while the latter came to be applied specially to the refined metal, the former was employed to denote native gold, which frequently contains notable quantities of silver, copper, and other metals. The term employed for this native alloy, transferred to the artificial alloy of gold and silver afterwards made, was applied also to amber on account of its colour and inferior lustre. The word is referred to a root signifying splendour, like the sun, and etymology based on the property of amber to become attractive of light bodies falls to the ground.

ELECTUARY (Latin, *electuarium*), a medical preparation mixed with sugar, now called a confection (*confectio*).

ELEGIT, in English law, a writ by which a creditor who has obtained a judgment against a debtor, and is hence called the *judgment-creditor*, may be put in possession of the lands and tenements of the person against whom the judgment is obtained, called the *judgment-debtor*, until the debt is fully paid. The writ is addressed to the sheriff, who enforces it; but he only gives a legal right to possession: if this is resisted the creditor must proceed by ejectment. When the creditor's claim is fully satisfied, the debtor may recover his property by an ejectment, or by reference to one of the masters of the court from which the writ has issued. The creditor in possession is called *tenant by elegit.*

ELEGY, commonly a mournful and plaintive poem, as is implied by the signification of the Greek name—(*elegos*, usually derived from E! E! *legein*, to cry woe! woe!) But the Greeks and Romans had elegies which were so called only from the measure of the verse, and were on various subjects. The elegiac measure of the ancients was the distich (which see), consisting of the hexameter alternating with the pentameter. In this verse, not only sorrow breathes soft lamentations, but joy and love pour themselves forth in its flowing numbers. Even the war-songs of Tyrtæus and Callinus were in elegiac verse, as were also many of the didactic and heroic poems and moral maxims of the ancients. As the distich was a favourite measure for epitaphs and inscriptions on tombs, a little poem of this sort came to be called an *elegy.* The distich, however, as already mentioned, was never used exclusively for mournful poems, and hence it is well to distinguish poems in elegiac verse from elegy itself. Goethe and Voss, like the ancients, have happily applied this measure to joyful subjects. In the other modern languages elegy commonly signifies a mournful poem.

ELEMENTARY EDUCATION. See SCHOOLS.

ELEMENTS. The history of the elements is the history of philosophy. This is absolutely true of the earlier Greek systems, the aim of which was to discover the universal which would explain all phenomena. The reconciling of systems led to closer observation of particulars; the defects in accumulated observations occasioned new theories, these led to controversies, which again returned to observations. Gradually the elements appeared as vague qualities, and philosophers occupied themselves, some with inquiring, not what is that of which all the diverse forms we see is composed, but how do we see it? what are the conditions of our seeing it? leading to the theory of knowing; while others applied themselves to the matter-of-fact study of natural phenomena. It is from the latter class that the modern doctrine of the elements is derived.

Guided partly by Aristotle's classification of first principles, fire as dry and hot, air as hot and moist, water as moist and cold, earth as cold and dry, which included both the forms and properties of matter, and allowed of indefinite gradations, partly by observation and inference, that what can be got out of a body must be one of its constituents, the medieval chemists, who were specially devoted to the study of metals, metallic ores, and mineral substances, and the effect of heat upon them, supposed that the metals consist of an elemental sulphur and an elemental mercury mixed together more or less perfectly, and in different proportions. To these were subsequently added salt and some others to express the results of experiment, so that about two hundred years ago the first principles amounted to five, and were divided into two classes: the active, consisting of mercury or spirit, sulphur or oil, and salt; and the passive, consisting of water or phlegm and earth, or the terrestrial part. It was at this time that Boyle attacked both the Aristotelian and the chemical elements, but his suggestion that undecomposed bodies should be considered as elements was without any marked effect. The names remained, not so much as denoting substances or ultimate principles as gradually coming to denote functions; and as the problems in chemistry grew more defined, and the study was taken up by men of thought, the first great modification was the expansion of the idea of elemental sulphur into phlogiston by Stahl. The power of the hypothesis was soon displayed in the recognition of a common character in apparently dissimilar actions, and this influenced opinions regarding the elements. Much less attention was given to them because actual discoveries were making on all sides, and the adherents of the phlogistic theory soon gave up the old elements and applied the term to phlogiston, to the gases then discovered, the mineral, vegetable, and animal acids, the alkalies, earths, and metallic calces, oil, alcohol and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, and he therefore considered as elements, oxygen, nitrogen, hydrogen, sulphur, phosphorus, and carbon, the metals and the earths, and further practically defined as an element a body not yet decomposed. This conception of an element seems to have been tacitly employed by all subsequent chemists, and is now the common definition of the term. The remaining step in the simplification of the elements was made by Davy, who, decomposing the alkalies into metals and oxygen, opened the way for the reduction of the earths, so that in a few years the elements were reduced to two great classes, the metals and so-called non-metallic elements. Later investigations have generally tended in two directions: one to reduce the number of the elements by resolving two or more of them into one, the other to classify the elements according to some marked character. These attempts have not succeeded to expectation. No simplification of elements has ever been effected, while their actual number has increased. The classifications hitherto devised being founded on one or two characters only, have yielded imperfect results when applied to other characters. Such are the classifications into non-metallic and metallic, into electro-positive and -negative. In the article CHEMISTRY the more recent classification, according to atomicity, is given, which is also open to similar objections. The

most comprehensive of all the arrangements hitherto proposed is based upon the view that the elements form a great but very incomplete series of bodies, which may be divided into sections and groups, these divisions, however, serving to indicate the analogies between the corresponding members of the groups, as well as their differences. The results of this arrangement are very remarkable. Solitary unexplained phenomena become significant by correlation, the distinction between non-metals and metals disappears, and the shading off of one set of elements into another, which defeats every attempt at minute classification, is seen to be one of the main arguments for viewing them as a whole; the blanks existing in the series show that all the elements have not yet been discovered, and the whole arrangement is so cross-checked by the data obtained from chemical and physical properties alike, that it forms an excellent criterion for ascertaining whether already ascertained facts are reliable or not. It is difficult to say what will be the succeeding phase in the history of the elements.

ELEMENTS, MAGNETIC. In terrestrial magnetism the complete specification of the magnetic force at any place and time is given by stating the *magnetic elements* at that place and time: these are the magnetic declination, the magnetic inclination, and the total force or intensity. The declination at any place is the angle made by the magnetic axis of a needle free to turn in a horizontal plane with the astronomical north and south line: the inclination is the angle by which the magnetic axis of a needle free to turn in a vertical plane containing the *magnetic* north and south line dips from the horizontal. (See DECLINOMETER and DIPPING NEEDLE.) The total intensity is a number which expresses the force of magnetic attraction at the place and in the direction of the dipping-needle. It is properly expressed in *absolute units of force.* (For full information, see INTENSITY, MAGNETIC.) Sometimes the *horizontal force* is given as one of the magnetic elements instead of the *total force;* the latter is derived from the former *by multiplying it by the secant of the angle of dip.*

The magnetic elements for 1873 at Greenwich are as follow:—

Declination (or variation of the compass), .	19° 32′ w.
Inclination (or dip of the needle), . . .	67° 49′
Horizontal force (in British units), ...	3·83
Total force ,, ,, ...	10·27

ELEMI. Of this resin different kinds obtained from different trees come from the East and West Indies, and from Africa. The common West Indian is yellow or greenish, opaque or translucent, with a fatty lustre, friable, and very fusible. It is slightly heavier than water. It is readily soluble in ether, in turpentine, and in alcohol, insoluble in water. It is said to consist of two resins, one amorphous, the other crystalline, separable by alcohol. When distilled with water, it yields a colourless oil, with odour and faint taste, which is lighter than water, and boils between 330° and 340° Fahr. The quantity varies with the resin. Elemi is a regular constituent of spirit varnishes, and the resin, imported from Manilla, is used in medicine, mixed with simple ointment as a plaster.

ELEPHANT. This well known and sagacious animal belongs to the order of Proboscidea. Desmarest recognizes two recent species, the Asiatic (*Elephas Indicus*) and the African (*E. Africanus*, or *Loxodonta Africana*); of which the former is the largest, most readily domesticated, and best known. There are also several extinct species, whose remains are met with in almost every part of the world. Few quadrupeds have attracted more attention from mankind than the elephant. Formed, as it were, for the service of man in warm climates, it possesses every attribute that can render it useful. It is strong, active, and persevering, and so docile and sagacious as to be trained to almost any service. It is not easy to convey in words a distinct idea of the form of any animal, and this difficulty is peculiarly felt in attempting to describe the elephant. His eyes are extremely small, his ears very large and pendulous. The whole form is awkward, the head being large, the body thick, and the back much arched; the legs are very clumsy and shapeless, the feet slightly divided into, or, more properly, edged with, five rounded hoofs; the tail is somewhat like that of a hog, and fringed at the extremity by a few very thick, long, black hairs. The skin is generally of a deep ash-brown, approaching to black, though it is sometimes white or cream-coloured; skins of this last sort are highly prized, being one of the attributes of royalty in Siam, one of the titles of whose king is, *lord of the white elephant.* The tusks are not visible in young animals, but in a more advanced stage of growth they are eminently conspicuous, and in a state of maturity they project, in some instances, 7 or 8 feet. These tusks are enormously developed upper incisor teeth. The largest on record (possibly that of an extinct species) weighed 350 lbs. Several tusks measured by Eden were 9 feet in length, and Hartenfels measured one which exceeded 14 feet. Elephants sometimes attain the height of 15 feet, but their general height is about 9 or 10. Their weight is sometimes enormous, being from 4000 to 9000 lbs. The female is gravid twenty months, and seldom produces more than one at a birth: this, when first born, is about 3 feet high, and continues to grow till it is sixteen or eighteen years of age. It is said they live to the age of 100 years and upwards. They feed on vegetables, the young shoots of trees, grain, and fruit. The most singular part of the structure of the elephant is his trunk, which is peculiar to this animal, though the long and flexible snout of the tapir bears some resemblance to it. It appears to be an extension of the canals of the nose; it is cartilaginous, and composed of numerous rings, divided through its whole length by a septum, and terminates in a kind of movable finger. It is of such strength as to be capable of breaking off large branches from trees, whilst, at the same time, it is endowed with such exquisite sensibility that it can grasp the smallest object.

The disposition of the elephant is gentle, and his manners social; hence they are seldom seen except in troops. The wild elephants of Ceylon, which are much esteemed, live in small troops or families. In wandering from place to place the males, who are furnished with the largest tusks, put themselves at the head, and are the first to face every danger. In swimming over any large river they lead the van, and seek a proper landing-place; next follow the young elephants, clinging to each other by means of their trunks; whilst the remainder of the full-grown bring up the rear. These animals have, in all ages, been eagerly hunted. Some of the arts which have been employed to kill them or take them merit attention. The Hottentots in South Africa shoot them with tin balls: this chase is attended with considerable danger; for, with every precaution that can be used, the sagacity of the elephant often detects the approach of the hunter, who, in this case, will in all probability fall a victim to the rage of the animal, unless he can instantly disable him. In the island of Sumatra the inhabitants split sugar-canes, of which food the elephant is very fond, and impregnate them with poison. In Abyssinia they are pursued by hunters

on horseback, in the following manner: Two men, perfectly naked, mount the same horse; the hindermost is armed with a broadsword, the lower part of which is covered with cord, and the remainder is exceedingly sharp. In this manner they pursue the elephants, and having singled out one they irritate him to attack them, when they ride up close to him, and the armed man slips from the horse on the off side, and whilst the elephant's attention is engaged with the horse he divides the tendons of his foot with a single blow, and thus disables him, when he is despatched by lances. They are also taken alive in pitfalls, or are driven into inclosures; in either case they are fed scantily, though regularly, for a few days, when tame elephants are employed to engage their attention till they can be tied fast to a tree; after they have become somewhat dispirited they are led away between two tame ones, and put under the care of keepers, who gradually bring them into subjection, more, however, by caresses and soothing than by coercion. When tamed they become the most gentle and obedient of all domestic animals, and in most cases are exceedingly fond of their keepers, and soon learn to distinguish the various tones of the human voice, as expressive of anger, approbation, or command. The domesticated elephant performs more work than six horses, but at the same time requires much care, and a plentiful supply of food. He is generally fed with rice, either raw or boiled, and mixed with water. To keep him in full vigour, 100 lbs. of this food is said to be required daily, besides fresh herbage to cool him, and he must be led to the water twice or thrice a day to bathe. His daily consumption of water as drink is about 40 gallons. Desmarest states that he daily requires about 202 lbs. of aliment of all sorts.

To enumerate all the services of these useful animals would be incompatible with the design of this work. They are employed in carrying burdens on their bodies, necks, and even in their mouths by means of a rope, the end of which they hold fast with their teeth; they load a boat with amazing dexterity, carefully keeping all the articles dry, and disposing them where they ought to be placed. In propelling wheel carriages heavily laden upon a declivity they push them forward with their forehead, and support them with their knees. In dragging beams of wood along the ground they remove obstacles or elevate the ends of the beams so as to clear them. Before the invention of firearms they were used in war by many nations of antiquity; they are still employed in the East in dragging artillery over mountains. During the rutting season this animal is often seized with a madness which deprives him of all tractability, and renders him so dangerous that it is often necessary to kill him. In many parts of India elephants are made the executioners of justice, for they will with their trunks either break the limbs of a criminal, trample him to death, or pierce him with their tusks, as they may be directed. In the island of Ceylon the general value of an elephant is between £50 and £60; but if there is any blemish, as a want of tail, &c., very considerable deductions are made. They are taken at certain stated periods, and generally a great number are sold together by auction. The structure of the elephant's ear has been investigated with great accuracy by Sir Everard Home. The drum and every other part of the organ is much larger in proportion than in other quadrupeds or in man; and there is a remarkable difference in the arrangement of the muscular fibres of the drum of its ear when compared with some quadrupeds and the human species. In the human ear those fibres are radii of a circle; and in the horse, the hare, and the cat they are of a uniform length; but in the elephant's ear these fibres are so placed that some are more than double the length of others. Sir E. Home argues, from this remarkable construction, that the elephant has not a musical ear, but that it has a peculiar compensating power in this length of fibre, as its slower vibrations enable it to hear sounds at a great distance. The tusks of the elephant have long been applied, under the denomination of *ivory*, to a variety of important uses in the arts. From the fossil remains which have been discovered it is apparent that they must have been abundantly distributed over the earth in former times. (See MAMMOTH and MASTODON.) The accounts of the manners and intelligence of the elephant as given by writers, although in many cases evidently exaggerated, still afford proof of a surprising degree of sagacity, and fully entitle him to the rank of

> 'The wisest of brutes, with gentle might endowed;
> Though powerful, not destructive.'

The African Elephant is distinguished from the Indian by its greater height, its larger ears, its more convex forehead, the closer approximation of the roots of the tusks, and the greater density of the bone. The back is concave not arched, and both sexes have formidable tusks, though they are smaller on an average than in the Indian. The dental laminæ are also fewer and more sinuous on their margins.

ELEPHANT, ORDER OF THE, an ancient Danish order of chivalry. It is said to have been instituted about the end of the twelfth century by Canute VI. to perpetuate the memory of a Danish Crusader who had killed an elephant in the Holy Land. It was renewed by Christian I. in 1462, and placed on its present footing in 1693 by Christian V. It is the highest of the Danish orders. The bearers must be Lutherans, must have attained thirty years of age, except the princes of the royal family, who are admitted at the age of twenty, and must have been for at least eight days knights of the order of the Danebrog. The number of members, not counting those of the royal family, is restricted to thirty. Foreign sovereigns are excepted from these restrictions. The statutes of the order were renewed in 1808, and the knights of Danebrog who receive the order of the Elephant must now wear their old decorations under the new. The fête of the order is held on the 1st of January, when the knights meet in the chapel of the order in the castle of Fredericksburg, taking rank by seniority upon seats over which are suspended their arms and devices. The insignia of the order are an enamelled white elephant, bearing on a blue housing, bordered with gold and crossed with white, a sculptured tower. This decoration is borne on a blue ribbon worn as a scarf from right to left. A star with a white cross is worn on the left breast. On state occasions the elephant is worn attached to a chain composed of elephants and castles of gold, with a letter D in gold to represent *Dania* (Denmark). The device of the order is *Magni animi pretium.*

ELEPHANTA, or ELEPHANT ISLE, called by the natives *Gharipur*, a small island in the Bay of Bombay, between Bombay and the mainland, 7 miles north-east of the former; circumference about 5 miles. It consists of two long hills and an intervening valley. It is chiefly overgrown with wood, but has a few inhabitants, who rear sheep and poultry for the Bombay market. It is celebrated for a cave temple 130 feet long, 123 broad, and 18 high, supported by pillars cut out in the rock. Many of these were cut down by the Portuguese. There are eight pillars or pilasters in a line from the north to the south and from the east to the west entrances. In the centre is a gigantic trimurti or three-formed god—Brahma the creator in the middle, with Vishnu the preserver on one side, and Siva the destroyer on the other. There are other

compartments containing other symbolical representations of Hindu deities. The date of these constructions is not known, but is supposed to be very remote. A large elephant clumsily cut out on a rock near the landing-place gives its name to the island.

ELEPHANTIASIS (from *elephas*, an elephant), a disease so called from the legs of people affected with it growing scaly, rough, and wonderfully large, at an advanced period, like the legs of an elephant. The disease attacks the whole body, but mostly affects the feet, which appear somewhat like those of the elephant. It is known by the skin being thick, rough, wrinkly, unctuous, and devoid of hair, and mostly without the sense of feeling. It is said to be contagious. Elephantiasis has generally been supposed to arise in consequence of some slight attack of fever, on the cessation of which the morbid matter falls on the leg and occasions a distension and tumefaction of the limb, which is afterwards overspread with uneven lumps and deep fissures. By some authors it has been considered as a species of leprosy; but it often subsists for many years without being accompanied with any of the symptoms which characterize that disease. It sometimes comes on gradually, without much previous indisposition; but more generally the person is seized with a coldness and shivering, pains in the head, back, and loins, and some degree of nausea. A slight fever then ensues, and a severe pain is felt in one of the inguinal glands, which after a short time becomes hard, swelled, and inflamed. No suppuration, however, ensues; but a red streak may be observed running down the thigh from the swelled gland to the leg. As the inflammation increases in all the parts the fever gradually abates, and perhaps, after two or three days' continuance, goes off. It, however, returns again at uncertain periods, leaving the leg greatly swelled with varicose, turgid veins. the skin rough and rugged, and a thickened *membrana cellulosa*. Scales appear also on the surface, which do not fall off, but are enlarged by the increasing thickness of the membranes; uneven lumps with deep fissures are formed, and the leg and foot become at last of an enormous size. A person may labour under this disease many years without finding much alteration in his general health except during the continuance of the attacks; and perhaps the chief inconvenience he will experience is the enormously bulky leg which he drags about with him. The incumbrance has indeed induced many who have laboured under this disease to submit to an amputation; but the operation seldom proves a radical cure, as the other leg frequently becomes affected. Hilary observes that he never saw both legs swelled at the same time. Instances where they have alike acquired a frightful and prodigious size have, however, frequently fallen under the observation of other physicians.

ELEPHANTINE (Arabic, *Djeziret-el-Sag*), a small island on the Nile, opposite Assouan (Syene), remarkable for the ruins with which it is covered. The northern part is low, the southern elevated and rocky. The Nile for nearly a mile above is interrupted by numerous small rocks of that fine red granite which characterizes this island, and which produced so many portals, columns, and obelisks to adorn the chief cities of antiquity. The island is covered with ruins piled upon each other—Egyptian, Roman, Saracen, and Arabic. Of these the Egyptian, though the most ancient, are in the best state of preservation. It is supposed that there was once a great temple here, dedicated to the god Cnuphis, all traces of which are now obliterated, with the exception of a pyramidal portal of red granite, presumed to have formed the entrance. There are two small temples, one of which is believed by Denon to belong to the earliest ages of Egypt. It is covered within and without with hieroglyphics, executed in a style of peculiar excellence. On the eastern side of the island are remains of a high wall, of which the masonry is admirable.

ELEPHANT'S FOOT (*Testudinaria elephantipes*), a plant of the natural order Dioscoreaceæ, separated by Salisbury from the genus *Tamus*, and distinguished by the form of its root, the stock of which forms a nearly hemispherical mass, rising a little above the ground, and covered with a thick corky bark, divided by furrows crossing each other at right angles into sections resembling the base of a pyramid. A climbing stem bears the organs of the plant. As the root is the only distinction of this plant from the other species of the genus *Tamus* the new genus has not been universally recognized by botanists. The root of the *Testudinaria* or *Tamus elephantipes* is used by the Hottentots for food.

ELEUSIS (now *Lepsina*, a village), next to Athens was the principal city of Attica. It was chiefly distinguished for the celebration of the mysteries of Demeter (Ceres) and Persephone (Proserpine). Neither the founder of these mysteries nor the time of their origin is known, although numerous conjectures on both points have been made. They were among the oldest and most venerated in Greece. It is said that when in the reign of Erechtheus Eleusis was subdued by the Athenians, the Eleusinians reserved to themselves the control of the mysteries. At a subsequent period a temple was erected to Demeter, in Athens; but the original seat of the mysteries still continued to be regarded with special veneration, and the rites were afterwards celebrated partly there and partly at Athens. As a preparation for the greater mysteries celebrated at Athens and Eleusis, lesser Eleusinia were celebrated at Agræ on the Ilissus. These were held every year in the month Anthesterion (February—March), and the initiated, who bore the name of *Mystæ*, had to wait another year before they were admitted to the greater mysteries. The principal rites consisted in the sacrifice of a sow; the administration of an oath of secrecy by the *Mystagogus*, and some preparatory instruction for the greater mysteries. These latter were also celebrated yearly in the month Boedromion (September—October). They lasted nine days, beginning on the 15th of the month. The celebrations of each day were different from those of the others. They consisted in processions, torch-bearing and other mystic ceremonies, which were attended with oaths of secrecy. On the sixth day those taking part in the ceremonies went in solemn procession from Athens to Eleusis, and on the night between the sixth and seventh day the initiated were led by the mystagogus through the dark into the lighted interior of the sanctuary, where the final mysteries were revealed. On the seventh day the initiated returned to Athens, and sitting down on the bridge over the Cephisus, indulged in all manner of jests and raillery on the passers-by. This also had a symbolical meaning. The last two days were supplementary, and of lesser importance. The Eleusinian mysteries are supposed to have been continued down to the time of Theodosius I. In later times the mysteries were generally supposed to have reference to the prospects of a future state, but this does not appear to have been their original intention, but a meaning subsequently put upon them when speculative ideas on this subject began to prevail.

ELEUTHERA, one of the largest of the Bahama Islands. It is of very irregular shape, and like most of the islands of the group long and narrow, its length being about 70 miles, and its breadth in general from 2 to 4, though in one part it is 10. Pop. over 5000.

ELEVATION, in the ritual of the mass, is the lifting up of the elements immediately after consecration, to be worshipped by the people. It was introduced into the liturgy of the Latin Church in the eleventh century, in consequence of the heresy of Berengarius, which consisted in denying the real presence in the sacrament. The Council of Trent ordered that the host should be worshipped with the highest adoration, that of *latria*, which is offered to God only. In the 28th Article of the Church of England it is said—'The sacrament of the Lord's Supper was not by Christ's ordinance reserved, carried about, lifted up, or worshipped.'

ELEVATION, in architecture, is a plan of a building drawn in vertical section, without perspective, and according to a geometrical scale.

ELF. See FAIRY.

ELF-ARROWS, ELF-BOLTS, ELF-SHOT, are the names given to implements of stone of various sizes and forms, which are found abundantly in many countries, and are the remains of arrow-heads, darts, and other ancient barbarian weapons. In our article CELTS some account will be found of the period and mode of manufacture of the similar weapons (hatchets, &c.) known by that name. It need only be here observed that stone arrow-heads are likely to have been used much later than such weapons as hatchets, because even after the use of bronze was introduced its high cost would prevent it from being applied to a purpose for which stone was nearly as suitable. These rude and ancient implements are objects of some extraordinary superstitions. The names given above are, of course, of popular and comparatively modern origin, and imply that those who gave them were completely ignorant and unsuspicious of the real origin and use of those weapons. These names are found independently among the peasantry in Scotland, England, and Ireland, and the superstitions associated with them are much more widely spread. According to the popular belief the stones are of supernatural origin, and various virtues are attributed to them. They are worn as charms, and used as a protection against lightning; but they are chiefly suspected of mischievous consequences. When cattle take ill they are supposed to have been struck with them, and even men are occasionally wounded by them. An Irish bishop was thus shot at by an evil spirit. They appear suddenly in great quantities where they were not to be found the day before. Indeed, a cavern has been pointed out where the archfiend carries on the manufacture with the help of attendant imps, who rough-hew them while he finishes the work. Similar superstitions prevail in Italy, Africa, and Turkey. See Evans' Ancient Stone Implements of Great Britain.

ELGIN, or ELGINSHIRE, also called MORAYSHIRE, a northern maritime county, Scotland, bounded N. by the Moray Firth; E. and S.E. by Banffshire; S. by Inverness-shire; and W. by Nairnshire; area, 340,000 acres. Along the sea-coast the surface is flat, but inland it rises into hills of moderate elevation, intersected by fine and fertile valleys. The coast line, which extends upwards of 30 miles, presents, in the middle portion, bold precipitous rocks of sandstone, with a few detached masses, while the two extremities are for several miles formed of vast mounds and raised beaches of sand and gravel. The chief rivers are the Spey, Lossie, and Findhorn, all remarkable for their romantic and picturesque scenery, particularly the Findhorn, in which, and the Spey, there is good salmon-fishing. There are several lochs in the county, having fine scenery and abundance of excellent trout. The rocks in the south consist of granite, felspar, quartz, mica, slate, sandstone, and gravel. The banks of the Spey, towards its mouth, exhibit secondary rocks of red sandstone, which extend east throughout the north plain of the county. Many large and inexhaustible quarries of freestone are worked, especially near the coast. There are also some slate quarries, but neither coal nor any metallic ores occur, while lime, even for agricultural purposes, has to be imported. The climate is noted for its general mildness, dryness, and salubrity. The soil on the low level tract of land which stretches along the entire coast, with a breadth varying from 5 to 12 miles, is, with exception of some sterile lands close by the sea, very fertile, and highly cultivated, the staple production being wheat. In other parts of the county oats are the chief crop. Barley, beans, pease, clover, grasses, potatoes, and turnips are also grown, but, excepting the last two, to no great extent. The great majority of farms are small, ranging from 50 to 100 acres, although they sometimes reach 300 acres. A great portion of the surface of the south and high lands is still covered with native forests, or with uninclosed commons of furze and broom. The number of acres under crop of all kinds in 1872 was 101,572, of which 95,249 were under corn and other rotation crops, and 6157 under permanent pasture. The number of cattle in 1872 was 19,001; sheep, 162,492; agricultural horses, 4493. The exports from the county are corn, timber, whisky, and salmon. The county unites with Nairnshire in returning one member to the House of Commons. Principal towns and villages—Elgin, the county town, Forres, Fochabers, and Burghead. Pop. (1871), 43,612.

ELGIN, an ancient city, now a royal and parliamentary burgh, capital of the above county, on the Lossie, about 5 miles from its influx into the Moray Firth, 37 miles E. of Inverness, 70 N.W. of Aberdeen. It is pleasantly situated on a gently rising ground, and is surrounded by an amphitheatre of wooded heights. The High Street is a spacious well-paved street running east and west and about a mile long. A distinguishing feature of the town is the number of its elegant mansions and villas. The principal public buildings are the parish church, in the centre of the main street, a beautiful Grecian edifice, with a richly ornamented cupola and a Doric portico; the other churches (including a Roman Catholic and an Episcopal church), Grey's Hospital, the Elgin Institution, the academy, assembly-rooms, the city and county buildings, the Elgin Club, the market buildings, the museum, the lunatic asylum, the Morayshire union poor-house, and the jail. The most interesting architectural object in the town, however, is the cathedral, now in ruins, but once the most magnificent in Scotland. Of this venerable building, 'The Lanthorn of the North,' as it was called, there remain some splendid fragments only. Its entire length was 282 feet by 86 feet broad, the transept was 115 feet in length, and the tower which rose from its centre, 198 feet high. Its foundation-stone was laid by Bishop Andrew Moray, July 19, 1224. It was plundered and burned in 1390 by the 'Wolf of Badenoch,' Alexander Stewart, son of Robert II.; again, in 1402, by Alexander, third son of the Lord of the Isles; restored 1390 to 1424; and again plundered in 1568, when its leaden roof was stripped off by order of the Regent Murray and his council, since which period it has gradually fallen into its present state of decay. It is now carefully preserved under the supervision of the Commissioners of Woods and Forests. There are a literary and scientific association, with a museum rich in geology, natural history, and antiquities, a mechanics' institute, circulating library, &c. There are a woollen cloth factory, an iron foundry, two tanneries, two breweries, coach-works, &c., and a

considerable trade in grain, butter, and other farm produce. Elgin unites with Cullen, Banff, Peterhead, Kintore, and Inverurie (the Elgin burghs), in sending a member to the House of Commons. Pop. of parl. burgh in 1871, 7340; of entire town, 7445.

ELGIN, JAMES BRUCE, EIGHTH EARL OF, and twelfth Earl of Kincardine, Governor-general of India, was the eldest son of Thomas, seventh earl, and was born in London 20th July, 1811. He was educated at Eton and Christ Church, Oxford, was first-class in classics in 1832, and became a Fellow of Merton College. In 1841 he entered Parliament as member for Southampton, and in the same year he succeeded to the earldom, and resigned his seat in 1842, on being appointed Governor-general of Jamaica. In 1846 he was appointed Governor-general of Canada, and succeeded by a conciliatory policy in allaying the discontent which had begun to break out in that colony. In 1849 he was raised to the British peerage as Baron Elgin of Elgin. In 1855 he returned to England, and was sent in 1857 as special ambassador to China. Having learned on his way of the outbreak of the Indian mutiny, he diverted to India the troops that should have accompanied him, in order that they might assist in suppressing the rebellion. Notwithstanding this weakening of his force he was successful in concluding the Treaty of Tientsin, early in 1858, by which the object of his mission was accomplished. In 1859 he became a member of Lord Palmerston's cabinet, with the office of postmaster-general. In 1860, his brother having been refused entrance into Pekin according to the treaty, Lord Elgin was sent to enforce the demand, which he did by entering Pekin in state. Immediately thereafter he was appointed to succeed Lord Canning as Governor-general of India. He maintained internal peace, and exerted himself unceasingly for the internal development of the country. He died on 20th November, 1863, at a hamlet in the Himalayan passes called Dhurumsala, while engaged in a tour of inspection of the north of India.

ELGIN MARBLES, the name given to a splendid collection of basso-rilievos and fragments of statuary, which were brought from the Parthenon of Athens to England, by Lord Elgin, in 1814. They were afterwards purchased by the British Parliament for £35,000, and are now to be seen in the British Museum. The Elgin Marbles are some of the finest remains of ancient art, and offer the richest field for study. In the Vatican are casts in plaster of these superb relics. Casts have been made also for Würtemburg, Russia, and other states. The largest part of them (ninety-two pieces) are from the Parthenon of Athens, and were, perhaps, executed from designs by Phidias. Such an important collection of antiques has, of course, drawn forth numerous publications. The learned Visconti wrote a work on the Elgin Marbles (London, 1816), and an official report was drawn up from the notes of this accomplished scholar, which contains the opinions of most of the first sculptors and painters of our age respecting these statues, expressed in the strongest terms of admiration.

ELGIVA. See EDWY.

EL-HARIB, a territory in the north-west of Africa, to the south of Morocco, to which it is tributary, important as the stopping-place of caravans passing from Timbuctoo, through the desert, to the north-west of Africa. El-Harib is situated between two chains of mountains, which extend from east to west, and separate it towards the north from the Empire of Morocco.

ELHUJAR, or ELHUJART (FAUSTO D'), was born at Logroño, in Spain, in 1755. Along with his brother, Juan José, he studied mining and chemistry at Freiberg, and at Upsala under Bergman. In 1783 they engaged in the investigation of a mineral, which resulted in the discovery of the element *tungsten*, compounds of which are now used for making light fabrics fire-proof, and for painting. Scheele had previously obtained it as the acid in the mineral tungsten; Bergman showed that it was probably a metallic compound. The d'Elhujars first distinguished tungsten from cerite, and showed that the mineral wolfram contained the acid discovered by Scheele, to the extent of 65 per cent., combined with iron and manganese. This acid they mixed with charcoal, heated up the mixture in a crucible, and on opening it got a very friable metallic button consisting of microscopic metallic globules. This they called *tungsten metal*. The discovery was fully confirmed by other chemists, and tungsten has been the object of considerable investigation.

Fausto d'Elhujar was subsequently director-general of the Mexican mines, and published on the theory of amalgamation and other subjects in the Journal of the Mining Society, of which he was a member. His observations are very acute, and refer to facts which lay apart from the ordinary course of chemical experiment. He was latterly minister of state in Spain. He died at Madrid, January 6, 1832. His brother died in Mexico.

ELIAS. See ELIJAH.

ELIAS, MOUNT ST., the culminating point of North America, 17,860 feet above sea level. It stands near the west coast, on the line of demarkation between the British territory and the United States territory of Alaska, and is seen towering magnificently above a number of snow-clad peaks.

ELIJAH. The most distinguished of the prophets of Israel. His history is to be found in 1 Kings xvii. to xxi., and 2 Kings i. and ii. He flourished during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram. He was especially employed to denounce vengeance on the kings of Israel for their apostasy from the national faith, and many miraculous circumstances are recorded of his life. He incurred the anger of Jezebel, the wife of Ahab, for slaying the prophets of Baal and of the groves at the brook Kishon, and she instigated her husband to put him to death; but Elijah fled to Horeb, where he received a divine manifestation, and afterwards returning to Samaria denounced the vengeance of God against Ahab for the murder of Naboth and the usurpation of his vineyard. Elijah was at length taken up to heaven in the presence of Elisha, his successor, who saw him ascend in a chariot of fire (2 Kings ii.) This event occurred, according to Ussher, B.C. 896. The prophet Malachi predicted (Mal. iv. v.) the return of Elijah to prepare for the advent of the Messiah. The Jews understood this of a literal return; but Christ, after the transfiguration, in which Moses and Elijah appeared to him, explained it of the coming of John the Baptist (Matt. xvii.)

ELIOT, JOHN, styled the *Apostle to the Indians*, was born in England in 1604, and educated at the University of Cambridge. After pursuing the occupation of a teacher in England, he emigrated in 1631 to Massachusetts. He became minister of the church in Roxbury, and soon conceived a strong passion for Christianizing and improving the condition of the Indians, of whom there were nearly twenty tribes within the limits of the British plantations. He acquired their language, and published a grammar and a translation of the Bible in it. The merit is claimed for him of having been the first Protestant clergyman who preached the gospel to the North American savages. His evangelical labours and personal sufferings, his influence among

them, his zeal, courage, and exposure in protecting them from wrong and violence, are celebrated in a number of the publications on New England history and biography. This indefatigable missionary died in 1689 or 1690.

ELIS, a country in the west of the Peloponnesus, where Olympia was situated. (See OLYMPIC GAMES.) It was bounded on the east by Arcadia, on the south by Messenia, and ran along the coast, watered by the river Alpheus. Elis was the capital of the country. Eleus, one of its kings in early times, is said to have given origin to the name of the country.

ELISION, a term used in grammar to designate the cutting off of a short vowel at the end of a word when the following word begins with a vowel, for the purpose of avoiding the *hiatus*. In some languages, to mark where the elision takes place, an apostrophe is inserted. The elision occurs frequently in poetical language or versification, and more especially in Greek and Roman poets, who were wont in this way to cut off even diphthongs. The Romans in poetry cut off the whole syllable ending in *m*, when the next word commenced with a vowel or *h*, without using an apostrophe or any other sign to indicate the elision.

ELIXIR (from the Arabic *al ecsiru*, the essence of a substance, a chemical medicine; or, according to others, from *elixare*, to boil). The word was applied by the alchemists to the philosopher's stone, and the *elixir vitæ* was a substance which removed all diseases, and prolonged life indefinitely. They also gave it to certain other preparations, for instance, corrosive sublimate. It is the name of several medicines consisting of wine, or spirits of wine, and various resinous, bitter, vegetable substances. The word, however, is almost gone out of use, and its place supplied by *tincture*. Elixirs, indeed, differ from tinctures by having a thicker and more opaque consistence, and by containing less spirit. The stomach elixirs of Frederic Hoffmann and Stoughton are well known. The former is prepared by dissolving in Malaga or Hungary wine the extract of cardamoms, orange-peel, canella, myrrh, and adding to the solution a little tincture of cloves and of saffron. Stoughton's elixir consists of absinth, gentian, rhubarb, cascarilla and orange-peel, steeped in spirits of wine.

Paregoric elixir, a popular remedy for cough, contains opium, benzoic acid, camphor, oil of anise, dissolved in spirit and strained. Scotch paregoric omits camphor and adds saffron and strong ammonia, the proportions being besides different. Elixir of vitriol consists of cinnamon, ginger, spirit and sulphuric acid macerated for a week and strained, and a mixture of a large number of aromatic substances, with sugar, spirit, and sulphuric acid digested for three weeks constitutes Mynsicht's elixir.

Some of the older pharmaceutical preparations have now disappeared. Such are the elixir proprietatis introduced by Paracelsus, consisting of myrrh, aloes, and saffron digested in spirit; elixir salutis, consisting of senna, jalap, and coriander seeds, digested in spirit; elixir sacrum, of rhubarb, aloes, cardamoms, and spirit; and so on. The tendency now is to substitute small quantities of the active chemical principles of plants for these extracts, the character of which is quite vague, depending on the mode of preparation and the quality of the raw material used.

ELIZABETGRAD, a fortified town, Russia, in the government and 130 miles N. by W. of Kherson, in a plain on the Ingul. It consists of the town proper, built with the greatest regularity in spacious streets, occasionally lined with trees; of four suburbs, and of the citadel, surrounded by six bastions. The military colonies on this side of the Bug have their headquarters here. Pop. 31,968.

ELIZABETH, Queen of England, one of the greatest sovereigns of modern times, was the daughter of Henry VIII. and of Anne Boleyn. She was born at Greenwich, 7th September, 1533, and almost immediately declared heiress to the crown. After her mother had been beheaded (1536) both she and her sister Mary were declared bastards (28 Henry VIII. cap. vii.); finally she was placed after Prince Edward and the Lady Mary in the order of succession (35 Henry VIII. cap. i.) Thus, while the first two marriages of King Henry were both still held to be illegal, the children of both were legitimized. Elizabeth received a classical education, as was customary with females of rank in her time, and under her tutor Roger Ascham she is said to have attained very considerable proficiency in Latin and Greek. During her father's life, as well as in the reign of her brother, various negotiations were entered into for her marriage. The Duke d'Angoulême and Philip of Spain, who afterwards married her sister, were among the matches proposed for her; but the only affair of this kind in which she may be supposed to have been personally interested was the suit of Lord Seymour of Sudley, the Protector Somerset's brother. It is certain, that even during the life of Catharine Parr, the widow of Henry VIII., whom he married, the familiarities in which he indulged with the Lady Elizabeth were only too well encouraged. Both before this marriage and after the death of his wife he was a suitor for the hand of the princess; but his ambitious designs in this and other matters were not countenanced by the council, and ultimately cost him his life.

On the death of King Edward Elizabeth vigorously supported the title of Queen Mary against the pretensions of Lady Jane Grey, by which her own title as well as her sister's were barred. She rode to meet her sister, accompanied by 1000 horse, and this bold proceeding was of no small service in confirming the doubtful in their allegiance; but favours from rivals are proverbially ill received, and Elizabeth gained little for herself by a policy in which it was well understood she had her own interest in view. After Wyatt's conspiracy her life was in great danger, and was probably only saved by the intercession of Philip, who had not the rancorous jealousy of her sister. She was committed to the Tower, from whence she was removed to Woodstock, where she was confined with great strictness. She afterwards, through Philip's intercession, obtained greater liberty; but throughout the whole reign she continued an object of suspicion and surveillance. The danger she now incurred developed a trait in her character which ever after continued conspicuous, her power of dissimulation. She made every demonstration not only of conformity, but of zealous adherence to the established religion. She opened a chapel in her house; entertained mass-priests; kept a large crucifix suspended in her chamber; worked garments for saints and madonnas; and accompanied the queen in her religious professions. Her conduct in this must not be judged from the point of view of rigid Protestantism, which Elizabeth never professed; but there were some at least among the Romish ceremonies and customs to which she could not be supposed to give a sincere adherence. Nevertheless, her false zeal must have been well and ably sustained, for her conduct was not left to the report of friends, but carefully watched by spies and informers. It is remarkable that at this period, when her life was constantly in danger, Elizabeth did not rescue herself from the power of her sister by a marriage with a foreign prince. It was from no want of suitors that she failed to avail herself of this resource. Philip was most anxious to have her mar-

ried out of the kingdom; and if the Duke of Savoy, whom he proposed, was unacceptable from his Catholicism, there was Eric, son of the King of Sweden, who long after continued to press his suit; but Elizabeth refused both. The fact is, she felt in herself a capacity for rule, and her sister's health opened up for her an early prospect of the throne, which she was unwilling to peril. Mary's reign was not without advantage to Elizabeth. It tried her councillors as well as herself, and gave her the opportunity of selecting them to advantage. Her adviser throughout the whole of it was William Cecil, afterwards Lord Burleigh, who had already been a minister under Edward VI., and continued for the rest of his life to be one of the chief councillors and most able ministers of Elizabeth, to whom he was in many respects a congenial spirit.

On the 17th of November, 1558, Mary's disastrous reign came to a close. Elizabeth was immediately recognized queen by Parliament. In her first public appearances she showed how well she had studied the art of winning the hearts of the people, but her sister's severities had rendered her pains almost superfluous, and the great sense of relief from an almost intolerable oppression rendered her accession one of the most joyous on record. On entering London she was met by the bishops, whom she permitted to kiss her hand, with the exception of Bonner, 'whom she omitted for sundry severities in the time of his authority.' It was now that the caution and secrecy characteristic equally of Elizabeth and Cecil, and which enabled them to do such great things, appeared in spontaneous exercise. The Catholic religion was still predominant in the House of Lords, and any attempt to overthrow it suddenly might have been attended with the greatest danger. Elizabeth made no immediate change in her habits. For a full month the ceremonies of the Romish Church were retained in all their state. A solemn funeral service was held for Queen Mary in Westminster Abbey, at her interment on 13th December. On the 24th a similar service was held there for Charles V. The queen even intimated her accession to the pope. In private she allowed herself a little relaxation of her bonds. On Christmas-day, when the bishop was preparing to say mass in her great closet, she retired with her nobles after the Gospel was done. She retained the greater part of her sister's council, choosing only seven new councillors, who were Protestants, it is true, but who were not then known as such. Like Cecil and herself, they had all conformed, and possessed the necessary qualification for Elizabethan councillors of accomplished hypocrisy. Such were her difficulties, notwithstanding her great prudence, that at her coronation, which was conducted according to the Romish ceremonial, only one of all the bishops, Oglethorpe of Carlisle, could be found to set the crown on her head. The obstacle, it is said, was her refusal to permit the elevation of the host. She had also before this authorized the reading of the liturgy in English. The first great object of her reign was the settlement of religion. A Parliament was immediately called, to which this work was assigned. The Parliament met on 25th January, and was dissolved on the 8th May, but its object was already accomplished. The nation was prepared for a return to the reformed faith, and the Parliament was at the bidding of the court. The reformation of religion in England was the work of Cranmer, and had already been accomplished in the reign of Edward VI.; the re-establishment of the ecclesiastical system of the national church on the basis on which it has remained to the present day was the work of Cecil and Elizabeth, and it was nearly completed in this Parliament. The differences between the first and the second reformation were, generally, as respects the latter, in a retrograde direction. Elizabeth had some Romish prejudices. She could with difficulty be prevailed on to prohibit the worship of images. She is even said to have entertained some scruples as to the extent of the royal supremacy in spiritual matters; but if she did, they must have been purely speculative. They certainly vanished on the first taste of power.

If the formal establishment of the reformed religion was easily completed, the security and defence of the settlement was the main object of the policy and the chief source of all the struggles and contentions of her reign. What made the position so difficult was the intolerance by which at this period and for long after all religious sects were characterized. No sooner were the Puritans freed from the oppressive tyranny of Mary's reign than they began to claim predominance for their own dogmas. But it was far from the intention of the queen and the supporters of the Established Church, notwithstanding the common persecutions they had endured, to grant them even liberty of worship. Elizabeth's own determination, as expressed by herself, was that none should be allowed to turn aside either to the right hand or the left from the drawn line of prescribed duty, and in insisting upon uniformity of worship she was not singular, but was acting in the spirit of her age. This principle was not less firmly held in her reign than in her sister's, however the penalties for infringing it may have been modified; and the Catholics on the one hand, and the Puritans on the other, restrained only by their dread and hatred of each other, were made the irreconcilable enemies of the existing order. Moreover, from the necessities of the struggle the severities of Elizabeth's reign went on increasing as time advanced. At first no one suffered death for his opinions; but latterly, under various pretexts, many were put to death, chiefly for religion. Eventually, on one occasion, in 1575, the writ of De Haeretico Comburendo was revived, and two foreigners, in spite of an earnest appeal addressed to the queen by John Fox, the martyrologist, were consigned to the flames of Smithfield. The struggle against the Catholics was the most severe, chiefly because they were supported by foreign powers; so that while their religion was wholly prohibited, even exile was forbidden them in order to prevent their intrigues abroad. Many Catholics, particularly priests, suffered death during this reign. Simple nonconformity, from whatever cause, was pursued with the severest penalties. The fine imposed for non-attendance at church was £20 per month (Act of 1581), while so strait were the lines of conformity drawn, that many more clergymen were driven out of the church by differences about the position of altars, the wearing of caps, and such like matters, than were forced to resign by the change from Rome to Reformation. These stringent measures were, however, the rigid consequences of the false position assumed.

Elizabeth's first Parliament approached her on a subject which, next to religion, was the chief trouble of her reign, the succession to the crown: they requested her to marry. She replied in a long speech, declaring her intention to live and die a virgin. It is certain, from her conduct both before and after, that this declaration was only a convenient affectation of prudery, which at once served to flatter her vanity and to veil her real indecision. Elizabeth had all the susceptibility with more than the ambition of a woman. She saw too clearly for her own interest the restraints to which each particular marriage might subject her, and therefore, with obvious hesitation on more than one occasion, she shunned them

all; but in doing so she left the painful question of the succession open, which caused her more sorrow than almost the worst marriage could have done. Her wisest course would probably have been to have elevated some feeble favourite, over whom she might easily have retained her influence, to the throne. At this very time she had a proposal from the infatuated Philip. It was impossible she could have accepted him; but her dissimulation, which led her to make capital of everything, would not permit her to give him a direct refusal.

The love of power which kept her from marriage inspired in Elizabeth the most furious jealousy of all pretenders to the English succession, and led her into crimes which her otherwise mild and benignant disposition would have shunned. The ladies Catharine and Mary Grey felt her vengeance for the simple crime of marrying; although the latter, purposely to disarm her, had chosen a husband of no rank. Both were imprisoned till their death, while the lieutenant of the Tower was dismissed for permitting the husband of the former, the Earl of Hertford, to have access to her. Such actions might have rested in obscurity, but Elizabeth had a rival more illustrious who caused her far other anxieties, and her treatment of whom cast the deepest stain upon her reign, the unfortunate Mary, queen of Scots. The story of Mary's fate is mixed up with the political events of Elizabeth's reign, of which the briefest notice must suffice. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption by Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. She entered into a league with the Lords of the Congregation, or leaders of the Reformed party; and throughout her reign this party became distinctively an English one, and was frequently serviceable in furthering her policy. She also gave early support to the Huguenot party in France, and to the Protestants in the Netherlands, so that throughout Europe she was looked on as the head of the Protestant party. This policy roused the implacable resentment of Philip, who strove in turn to excite the Catholics against her, both in her own dominions and in Scotland. After the detention of Mary in England, a measure dictated rather by jealousy than by the usual good policy of Elizabeth, he fomented the various rebellions in her favour formed in England and Ireland, and at her death declared himself her avenger. Mary, as is well known, was imprisoned nineteen years in England, whither she fled to the protection of Elizabeth. Her imprisonment was followed by a series of conspiracies, beginning with that under the Earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The execution of Queen Mary was, nevertheless, the chief political blunder of Elizabeth's reign. The duplicity with which it was contrived, and Elizabeth's unscrupulous severity to her instrument Davison, have deprived the deed of any possible justification. If the death of Mary did not raise up new enemies to Elizabeth on the Continent it at least gave a just cause of scandal to those she already had, and it was no small attainment in bad policy to shock the master of Alva and the authors of the St. Bartholomew. To return for a moment to the last event, the news of the massacre of St. Bartholomew was received in England with horror. It did not, perhaps, excite quite so much in the court. Shortly after it occurred Walsingham sent his secretary to thank the king and Catharine de Medicis for the great care it had pleased them to have of the English during the late tumult. Elizabeth had for some time been engaged in a negotiation for marriage with the Duke d'Alençon (afterwards d'Anjou); the negotiation was still carried on, and was ultimately nearly successful. In 1580 the duke arrived in London to pursue his suit, which had lasted nearly ten years, in person. He was well received, but still the queen hesitated. It is said she wept because her council were less prompt in advising her to marry than formerly. She was now forty-seven. The following winter the duke paid another visit, and the marriage was all but concluded. But prudence prevailed, and she finally informed him she could never marry.

The state of France, as indicated by the change of government consequent on the accession of Henry IV., who was assisted by Elizabeth, obviated any danger that might have arisen from the indignation which the execution of Queen Mary had caused in that country. Nowhere, however, was that event more meekly borne than by King James. The Scottish Solomon had thought his mother's danger a favourable opportunity for sententious observations about the strangeness of her case, and now his philosophy was nonplussed. His awe of Elizabeth and his dread of interfering with his own right of succession to England made him powerless, and he accepted an addition to his pension in full of all grievances. Philip was not to be so appeased. He had other grievances, to which the execution of Mary lent edge. The fleets of Elizabeth had galled him in the West Indies, her arms and subsidies had helped to deprive him of the Netherlands; the Armada was already in preparation. Therefore he called the Queen of England a murderess, and refused to be satisfied even with the sacrifice she seemed prepared to make of her Dutch allies. The Armada sailed on 29th May, 1588. Its fate is too well known to need recapitulation. The war with Spain dragged on till the close of Elizabeth's reign.

During her long reign Elizabeth showed her judgment in nothing so much as in the councillors she trusted. But while the splendour of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham, Throgmorton, and the unfortunate Davison, who served her with a zeal which did not always spare even their own reputations, she had personal favourites of less merit who were often more brilliantly rewarded. It is sufficient to name Dudley, whom she created Earl of Leicester, offered as a husband to Mary, and would perhaps have gladly taken as her own; and Essex, who was still more a personal favourite, though much less a courtier. The latter had some merit as a soldier; but his violent temper, ill-suited to the queen's haughty disposition, brought about his ruin. He was beheaded in 1601, and Elizabeth never forgave herself his death. Her own health soon after gave way, and she died on 24th March, 1603, naming James of Scotland as her successor.

Besides its political glories, the reign of Elizabeth was the golden age of English literature. If all else could be forgotten, it would be remembered as the age of Spenser and of Shakspeare, not to mention a host of minor names. The naval achievements of Drake and the discoveries of Raleigh concurred to do it honour. Thus everything conspired to throw a halo round the name of Elizabeth, when regarded as a sovereign, and seen as she would be in her own day, especially by foreign beholders, through the drapery of state. If a minute criticism has exposed some of the weakness of the individual woman who bore this burden, it must be remembered that the process is only half fair. As a sovereign she is entitled to her surroundings, and as an absolute ruler, as to a great extent she undoubtedly was,

she must have her share of praise for the good that was done in her name. It is no small merit to select good councillors and to adhere to them. Elizabeth knew how to do both; and yet she was no puppet in the hands of her advisers. Though haughty and imperious to the Commons, she knew both when and how to yield. She studied with rare sagacity the temper of the people; and high as were her notions of prerogative, she may fairly be considered the first constitutional monarch of England. To such a sovereign many faults might be forgiven, if only, among her faults, she had been careful not to number crimes.

ELIZABETH (formerly *Elizabethtown*), a city, capital of Union county, New Jersey, United States of America, situated in a very fertile tract of country, and having a considerable trade and manufactures. It is the oldest town in New Jersey; the ground was purchased of the Indians in 1664, and settled soon after by emigrants from Long Island. Pop. (1870), 20,832.

ELIZABETH, St., of Thuringia, distinguished for her piety and virtue, the daughter of Andreas II., king of Hungary, was born at Presburg 1207, and in 1221 was married to Louis, landgrave of Thuringia, to whom she had been betrothed at four years of age. While the husband devoted himself to knightly exploits, the wife was distinguished by the mild virtues of her sex. When Germany, and especially Thuringia, was oppressed with famine and pestilence, she caused many hospitals to be erected, fed a multitude of the poor from her own table, and supplied their wants with money and clothing. She wandered about in a humble dress, relieving the sorrows of the wretched. Louis died on a crusade, and her own life terminated November 19, 1231, in an hospital which she had herself established. She was regarded as a saint by her admiring contemporaries, and four years after her death this canonization was approved by Pope Gregory IX. A beautiful church and a costly monument were erected over her tomb. The latter is now one of the most splendid remains of Gothic architecture in Germany.

ELIZABETHAN ARCHITECTURE, a style of architecture which began to prevail in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan style was a mixture of the Gothic with the Italian, often very picturesque, but without purity and unity of design. It was characterized by deeply embayed windows and galleries of great length. It was chiefly exemplified in the mansions of the nobility.

ELIZABETH PETROWNA, Empress of Russia, was the daughter of Peter the Great and Catharine. She was born in 1709 or 1710, and ascended the throne on 7th December, 1741, as the result of a conspiracy, in which Ivan VI., a minor, who had reigned only one year, was deposed. This conspiracy was also a reaction of the old Russian party against the reforming policy introduced by Peter I., and the influence of strangers on the internal government of Russia. Elizabeth is said to have rivalled her mother in beauty, and to have surpassed her in her love of pleasure. Her reign was stained both by her unbridled licentiousness and the tyranny of her government, which was conducted by favourites. Banishment to the mines of Siberia and imprisonment in dungeons was awarded for the slightest political offences. She was a patron of literature, and corresponded with Voltaire, to whom she supplied materials for his life of Peter the Great. She also founded the University of Moscow and the Academy of Fine Arts of St. Petersburg. Besides her numerous avowed lovers, she had a secret marriage with a Russian of low rank, but handsome appearance. During her reign Russia was engaged in several wars. The first, with Sweden, in 1743, was speedily and advantageously concluded by the Peace of Abo. Elizabeth afterwards sent an army, in 1748, to assist Maria Theresa in the war of the Succession, which contributed to bring about the Peace of Aix-la-Chapelle; and she joined in the Seven Years' war against Prussia, animated by hatred of Frederick II., some disparaging remarks made of her by Frederick having been reported to her for the purpose of exciting her enmity. She died in 1762, before this war was concluded.

ELIZABETH STUART, Queen of Bohemia, daughter of James I. of England and VI. of Scotland, was born in Falkland Palace, Fifeshire, on 16th August, 1596. A marriage was contracted between her and the Palatine Frederick, and celebrated with great pomp at Whitehall on 14th February, 1613. Her husband was then at the head of the Protestant interest in Germany, and in 1619 he accepted the crown of Bohemia offered to him by the revolted Protestants of that country. This he was only able to retain for a very short period; and after his defeat by the imperialists at the battle of Prague, on 8th November, 1620, he and his wife were obliged to flee, first to Breslau and Berlin, and then to the Hague. Elizabeth had thirteen children, several of whom died early. Charles Louis, the eldest surviving, was reinstated in the palatinate by the Treaty of Westphalia in 1648. His daughter, Elizabeth Charlotte, was the second wife of Philip, duke of Orleans, brother of Louis XIV. Her descendants were excluded by their Catholicism from the crown of England, but one of them was regent of France during the minority of Louis XV.; and another, Louis Philippe, ascended the throne after the revolution of 1830. Rupert and Maurice distinguished themselves in the civil war in England as Cavalier leaders. Sophia, the youngest, married into the house of Brunswick, became Electress of Hanover, and mother of George I. Elizabeth Stuart's cause was extremely popular with the English nation, and after her husband was deprived of the crown of Bohemia she still retained among them the endearing epithet of 'Queen of Hearts.' She returned to England at the Restoration with her nephew Charles II., and died at Leicester House, London, on 13th February, 1662.

ELK. See Deer.

ELL (Latin, *ulna*, the fore-arm), a measure which obtains, under different denominations, in most countries, whereby cloths, stuffs, linens, silks, &c., are measured. The ell English is 5 quarters, or 45 inches; the ell Flemish, 3 quarters, or 27 inches. In Scotland an ell contained 37·2 inches English.

ELLAGIC ACID, or Bezoardic Acid, is separated from oriental bezoars by dissolving them in cold strong potash, away from the air, passing a current of carbonic acid, collecting the ellagate of potassium, washing and recrystallizing it, and then liberating the ellagic acid by hydrochloric acid. It is insoluble in water, but dissolves in alcohol. It is a pale yellow, tasteless, crystalline powder, decomposed on heating. With the bases it forms salts, which are not very well known; they are crystalline, and insoluble or sparingly soluble in water. The lead and barium compounds are yellow. This acid can also be obtained from gallic acid, of which it is a product of oxidation. It was from this source that it was first got by Chevreul; it was afterwards identified by Wöhler with that from bezoars. It appears to be doubtful whether it occurs ready formed in gall-nuts, or whether it is produced in the process of extraction.

ELLENBOROUGH, Edward Law, Lord Chief-justice of the King's-bench, was born in 1750,

at Great Salkeld, in Cumberland. His father, Dr. Edmund Law, bishop of Carlisle, placed him at the Charter House, London, in 1762. He entered the University of Cambridge in 1768. He entered Lincoln's Inn in 1769, graduated B.A. in the university in 1771, and was called to the bar in 1780. By the patronage of Sir Francis Buller, one of the judges of the King's-bench, he early obtained a silk gown. On the trial of Warren Hastings, in 1785, Erskine having refused to undertake the defence, Law served as leading counsel. It required no little courage to encounter such opponents as Burke, Fox, Sheridan, and other eminent men of the time, who conducted the impeachment. Law was assisted by Plomer and Dallas, and, as is well known, obtained the victory. (See HASTINGS.) The defence did not come on until the fifth year of the trial. To the brilliant eloquence of his adversaries Law opposed simple, logical, and clear statements. After eight years, in which the trial had occupied 148 days, at an expense of £71,080, Hastings was acquitted. Law's success was now certain. In 1801 he was made attorney-general, and in 1802, on the death of Lord Kenyon, he became Lord Chief-justice of the King's-bench, and was created baron. He adopted the title Ellenborough from a small fishing village of that name, where his ancestors had lived for a long time. Under Lord Grenville's administration he became a member of the privy-council (1806), which by many is considered as unconstitutional. In Parliament he was opposed to the emancipation of the Catholics. He held the office of chief-justice for fifteen years, when his health sank under the duties of the office. He resigned his office in 1818. He died in December of the same year, at the age of seventy years. Lord Ellenborough enjoys a high reputation for legal ability.

ELLENBOROUGH, EDWARD LAW, FIRST EARL OF, the son of Lord Chief-justice Ellenborough, was born 8th September, 1790. He was educated at Eton and St. John's College, Cambridge, where he took the degree of M.A. in 1809. He entered Parliament as representative of St. Michael's in 1814, and in 1818, having succeeded his father as second baron, he entered the House of Lords. He first took office in 1818 as lord privy-seal under the Duke of Wellington. He became president of the board of control in 1828, which office he held till the fall of the ministry in 1830, and resumed in 1834 under Sir Robert Peel. When Peel became prime minister again in 1841 he resumed his post, but in a short time accepted the governor-generalship of India. He arrived in Calcutta in February, 1842, in time to take the control of the Affghan war, which, under the conduct of Generals Pollock and Nott, was brought to a successful issue. Scinde was conquered by Sir Charles Napier, and annexed in 1843. This was followed by the conquest of Gwalior. The conduct of the governor-general, however, had given great dissatisfaction at home. His policy at first had been vacillating, and latterly too warlike, and the vanity and indiscretion of his proclamations, particularly that referring to the gates of Somnauth, were looked upon as seriously impugning the soundness of his judgment. He was consequently recalled by the East India Company early in 1844. On his return, however, he was defended by the Duke of Wellington, received the thanks of Parliament, was created an earl, and decorated with the Grand Cross of the Bath. He held the post of first lord of the administration for about six months from the end of 1845 to June, 1846, and for two months again in 1858 held the office of president of the board of control from February to June, during which he wrote a secret despatch censuring the policy of Lord Canning, which caused much discussion, and led him to resign his office. He did not again resume office, but continued to take an active part in the proceedings of the House of Lords. He died 22d December, 1871.

ELLER, JOHANN THEODOR, of Brockhausen, was born Nov. 29 (O.S.), 1689, at Plötzkau, in Anhalt-Bernburg. Of a wealthy family, he received an excellent education, studied law at Quedlinburg and Jena, and then natural science and medicine at Halle, Leyden, and Amsterdam. After spending some time at the mines of Saxony and the Hartz, he went to Paris, continued his study of anatomy, and acquired chemistry under Lemery, Homberg, and other French teachers. Then he went to London, and on his return to Germany in 1721 was appointed Anhalt-Bernburg physician; in 1724, professor of anatomy in Berlin; 1735, physician to Frederic the Great; 1755, privy-councillor and director of the physical class of the Academy of Sciences. He died at Berlin, Sept. 13, 1760.

Eller did not contribute much directly to the science of chemistry, and in general took the side of opinions which were ultimately proved incorrect. He was a follower of Stahl, sought to prove that water can be converted into earth, and that the bulk of water is not altered when salts dissolve in it. On these and other points he entered into a controversy with his contemporary Pott, and Eller in particular has been blamed for the violence and private personalities which he introduced into it. His papers were published in the Memoirs of the Berlin Academy, and among them is a long and interesting review of the opinions held respecting the elements from the earliest times down to his own day. He also published a series of curious microscopic observations upon the change of blood corpuscles by the addition of different salts, tinctures of plants, and other solutions. Eller was undoubtedly a man of great learning and abilities, but his writings do not indicate a high degree of originality.

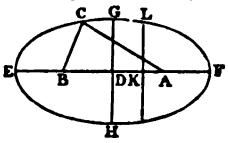
ELLERIANS, a sect of fanatics which arose in 1726, and had for its founder Elias Eller, a ribbon-weaver, who was born in 1690 at Ronsdorf in Berg, and appears to have lost his senses by reading the works of Jacob Böhme, and other mystical writings. He called himself the father, and his second wife the mother of Zion, and hence the sect is sometimes known by the name of Zionites. He divided his adherents into three classes—those who, according to his jargon, were in the court of the temple, those who were on the threshold of the temple, and those who were within the temple. The sect committed great excesses, and became very numerous.

ELLIOT, GEORGE AUGUSTUS. See HEATHFIELD.

ELLIOTT, EBENEZER, the 'Corn-law Rhymer,' was born on 17th March, 1781, at the New Foundry, Masborough, near Rotherham, Yorkshire. His father was a clerk at the foundry, a member of the Berean sect, a Calvinist of the strictest order, and a rabid democrat in politics. He was very poor, and had a large family to support. When a boy Ebenezer was noted for dulness, and he seemed at first inclined to be rather idle and dissipated in his habits, but he was rescued from this danger by the love of nature, and having acquired a taste for the study of botany he began to apply himself to self-education. At the age of seventeen he published his first poem, the Vernal Walk, which was soon after followed by some others. At this time he was engaged in his father's foundry. He afterwards married and commenced business, in which he did not succeed. He attributed his failure to political causes, and his animosity was particularly directed against the corn-laws. From 1831 to 1837 he carried on business with greater success as an iron merchant in Sheffield. Soon after coming here he began his corn-law rhymes in a local

paper. They were continued periodically, and soon attracted attention. Though rugged in diction, and harsh, and even savage in many of the thoughts to which they give utterance, they are nevertheless the genuine outpouring of a poetic soul burning with a sense of the oppressions to which, as he believed, a blind and selfish policy subjected his poorer brethren. They were afterwards collected and published in a single volume, with a longer poem entitled The Ranter. In 1829 appeared the Village Patriarch, the best of Elliott's larger pieces; and in 1834 he published a collected edition of his works in three volumes. These included many beautiful little pieces descriptive of Yorkshire scenery—the result of his early rambles in the fields and woods. Commercial losses compelled him in 1837 to contract his sphere of business, and in 1841 he retired from it altogether, taking up his abode at Great Houghton, near Barnsley, where he died on 1st December, 1849. Various contributions from his pen had appeared from time to time in the newspapers, and in Tait's Magazine since 1834; and in 1850, after his death, a posthumous collection of his writings in two volumes was published under the title of More Prose and Verse by the Corn-law Rhymer.

ELLIPSE, in mathematics, one of the conic sections. (See CONE.) Kepler discovered that the planets describe such a curve in revolving about the sun. It presents to the eye at once variety and regularity, and is therefore preferred by painters to the circle for the outline of their pictures. Two points in the longest diameter have this peculiarity: the sum of two straight lines drawn from them to any point in the circumference is always the same to whatever point they are drawn. On this is founded the usual method of describing an ellipse. At a given distance on the plane on which the ellipse is to be described fix two pins, A and B, and pass a string, A B C, round them. Keep the string stretched by a pencil, C, and move the pencil along, keeping the string at the same tension, then the ellipse E C G L F H will be described. A and B are the *foci*, D the centre, E F the major axis, and G H the minor axis, D A or D B is the eccentricity of the ellipse. If from any point L in the curve a line L K be drawn parallel to a tangent drawn to the end of the axis E F then will L K be ordinate to the axis E F, corresponding to the point L; and the portions E K, K F, into which L K divides the major axis, are said to be the abscisse to the ordinate L K.



ELLIPSIS, in grammar, the omission of one or more words, which may be easily supplied by the connection. It is common, especially in colloquial language, for the sake of brevity, and frequently adds to the strength and perspicuity of the sentence. Hence a more extended use of the ellipsis in rhetoric and poetry. In rhetoric it may be applied as a mere artificial ornament, the ellipsis being intended to be supplied not by a logical connection, but by one suggested to the imagination. Such artificial contrivances of rhetoric are, however, almost invariably cold and meaningless devices of pedantry. In the hands of a genuine poet or orator the ellipsis has a very different value. In natural language, from the brevity it affords, the ellipsis becomes in all its phases the language of passion, and especially of sudden and intense emotion; and the imitation of its natural use in this way is to the poet the most powerful instrument for painting passion to the life. The works of all the greater poets, and especially the Hebrew poetry of the Old Testament, abounds with familiar instances of this use of the ellipsis.

ELLIPTICITY OF THE TERRESTRIAL SPHEROID, a term used to denote the deviation of the form of the earth from that of a sphere. See DEGREE (MEASUREMENT OF).

ELLIS, GEORGE, an ingenious writer, born about 1745, was a native of London, and educated at Westminster School and Trinity College, Cambridge. He obtained an office under government during the administration of Mr. Pitt, and was secretary to Lord Malmesbury in his embassy to Lille in 1797. He was one of the junta of wits concerned in the well known political satire, The Rolliad, and wrote a preface, notes, and appendix to Way's translation from the French of Le Grand's Fabliaux; besides which he published Specimens of the Early English Poets, with an Historical Sketch of the Rise and Progress of English Poetry and Language, three vols. 8vo, and Specimens of Early English Metrical Romances, three vols. 8vo. The two latter works have passed through several editions; and they display much ingenuity, and a general, though not a profound, acquaintance with English literature. Mr. Ellis, who was a fellow of the Royal Society and the Society of Antiquaries, died in 1815, aged seventy.

ELLIS, JOHN, a celebrated naturalist, and one of the first who suggested the idea that the South Sea Islands were constructed and raised from the bottom of the ocean by means of zoophytes or the polypi inhabiting different species of coral (Essay towards a Natural History of Corallines, 1754). He was born in London about 1710, and died in 1776. He was for some time agent for the colony of West Florida and the island of Dominica. Among his works is a posthumous one entitled The Natural History of many Curious and Enormous Zoophytes (London, 1786). He was author of an interesting essay on British and Irish Corallines, and also of many valuable papers in the Philosophical Transactions.

ELLORA, ELORA, or ELOUROU, a ruinous village, Hindustan, Deccan, Nizam Dominions, province of, and 12 miles north-west of Aurangabad. Its ruins cover a considerable extent of ground, and are surrounded by a stone wall; but the interest they would naturally create is greatly lessened by the surpassing attractions of the neighbouring cave temples, the most stupendous and magnificent works of the kind in existence. They are excavated in the slope of a hill of red granite, shaped like a horse-shoe, and extend about a mile in length. Some are cut down through the rock, and left open above like an isolated building, and both externally and internally richly ornamented with the most elaborate sculptures. Others are excavated under the hill in the manner of caves properly so called, the interior being supported by massive pillars, variously but harmoniously ornamented. The interior walls likewise are often richly carved with mythological designs, among which human figures are the most numerous, in a great variety of grotesque and distorted forms. The cave temples have been divided into three classes—namely: the north, which are Buddhist, or probably Jain; the central, which are Brahmanical; and the south, which are evidently Buddhist. The most magnificent of the whole is the Hindu temple called Kailas or Cailas, apparently, like the other Brahmanical temples, dedicated to Siva. The central portion is 100 feet high, and forms an isolated excavated mass or immense block 500 feet in circumference. It is surrounded by galleries or colonnades at the distance of 150 feet, in which the whole Hindu pantheon is cut in the perpendicular rock. Every part outside and inside of this magnificent temple is elaborately carved in a most finished manner. Another temple, much smaller, though still likewise very fine, but cut under the hill, is the Buddhist cave of Vis-

vakarma. It is remarkable as being the only one excavated with a curved roof; and its design is characterized both by its stupendous proportions and its massive simplicity. The extreme depth of this excavation from the outer gate is 166 feet; the main cave is 80 feet long by 40 feet broad, and 35½ feet high; with twenty-eight octangular pillars, in two rows, besides two pillars supporting a gallery above the door-way. Above the pillars is a narrow architrave, and above this is a broad frieze; both are most elaborately carved; and in niches formed in the latter are sitting figures of Buddha, of whom also there is a colossal figure at the extreme end of the cave. There are six other principal excavations, some in the north, others in the south quarter of the mountain, filled with sculptures. When these caves were excavated is not certainly known; but being in the vicinity of Deoghir, now Daulatabad, which, prior to to the Mohammedan conquest, A.D. 1293, was the capital of a powerful Hindu principality, they probably originated in the superstitious feelings of the reigning families of that metropolis. See Pl. IX.—Architecture.

ELLWOOD, THOMAS, an early writer among the Quakers, was born in 1639 at Crowell, near Thame, in Oxfordshire, where he received such an education as the humble circumstances of his parents would afford. About 1660 he was induced to join the Society of Friends by the preaching of one Edward Burroughs, and he soon after published his first piece, entitled An Alarm to the Priests, or a Message from Heaven to warn them. He was imprisoned the same year on account of his religion. He subsequently became reader to Milton, with whom he improved himself in the learned languages, but was soon obliged to quit London on account of his health. In the year 1665 he procured a lodging for Milton at Chalfont, Bucks, and was the occasion of his writing Paradise Regained by the following observation made on the return of the Paradise Lost, which the poet had lent him to read in manuscript: 'Thou hast said much of paradise lost, but what hast thou to say of paradise found?' In 1705 he published the first part of Sacred History, or the Historical Parts of the Old Testament; and in 1709 Sacred History, &c., of the New Testament, which production was well received, and is still held in some estimation. His other works are numerous; among them Davideis, the Life of David, King of Israel, a poem, which is more distinguished for piety than poetry. He died in 1713, aged seventy-four. His life, written by himself, and published the year after his death, affords many interesting particulars of the history of his sect.

ELM. The species of elm (*Ulmus*), the type of the natural order Ulmaceæ, are trees or shrubs, with alternate serrated and simple leaves, and fascicles of small, inconspicuous flowers, which appear before the foliage. Two species deserve particular notice, *U. campestris* and *U. montana*. The *U. campestris*, or English elm, is a tall, elegant tree, of rapid growth; and although it is not famous for its ramifications, yet, from the density of its foliage and its clustering habit of growth, in bright weather it displays a variety of light and shade, such as painters appreciate in such objects. It is of erect growth, and yields a tall bole, remarkable for the uniformity of its diameter throughout; and few trees produce the same quantity of valuable timber in so short a period. If we except the oak, it is more common than any other timber tree in England, where it is said that upwards of forty places take their names from that of the elm, such as Nine Elms, Barn Elms, &c. Around the palaces, castles, cathedrals, old halls, &c., it is commonly met with of large dimensions and venerable character: but as it rarely produces seed in England, it is questionable whether it is a native of that country. If not truly indigenous, it must have been introduced at a very early period, and propagated by art. It is a native of the south and middle of Europe, and the west of Asia, and there it yields seed abundantly. In France plants are raised from seed in immense numbers. The tree is remarkable for its propensity to produce seedling varieties; many of these, of very feeble growth, have spread throughout this country, and are of no value as timber trees. The aptitude of the tree to vary from seed has rendered the genus very confused. About twenty sorts of *U. campestris* are cultivated in nurseries, and botanists are unable to determine which are species and which are varieties. The average height of a mature tree is 70 or 80 feet, but some elms are 150 feet high. The wood is brown, hard, and of a fine grain; and as it is not apt to crack, it is adapted for the manufacture of articles that require lateral adhesion, such as the wooden furniture in the rigging of ships; and its quality, as well as its figure of growth, render it very suitable for ship keels. It is also employed by the block and pump maker, the cart-wright, and cabinet-maker; and in London it is the common wood used in making coffins. The tree generally attains maturity in seventy or eighty years; after which it has a tendency to become hollow in the centre—a casualty from which younger trees are not exempt.

U. montana (the Mountain or *Wych Elm*).—This species is a native of Scotland, and very valuable as a timber tree. It grows to a less height than the English elm. Compared with the best varieties of that tree, it is of slower growth, yields a much shorter bole, but is far more spreading in its habit, more bold in its ramification, and more picturesque in figure, more hardy in constitution, and better adapted to adorn the glens and mountain sides which it is destined to occupy. It usually attains to the height of about 50 feet, but it is often found much higher when interspersed with taller-growing trees. It does not produce suckers, like the English elm, but it yields seed freely. It grows best in a rich deep soil, with an open subsoil. Where water stagnates near the surface its growth becomes feeble, and lichen overspreads its bark. The timber is much in request for agricultural purposes, such as naves for wheels, and handles for spades, forks, and other implements, where strength and elasticity are required. It is also extensively used in ship and boat building. The tree often yields large protuberances of gnarled wood, finely knotted by an accumulation of growth, and richly veined. These are much esteemed for veneering, and are often very valuable.

U. glabra, or smooth-leaved elm, is a species of elm common in some parts of Britain. It is of rapid growth, and forms many varieties. One of these, called the Huntingdon elm, is among the fastest-growing trees of the genus, and valuable for timber. It first appeared about the middle of last century. There are several varieties of cork-barked elm (*U. suberosa*), also of American elm, variegated elm, and curled-leaved elm. The most ornamental and picturesque tree of the genus is *U. pendula*, or weeping elm, of which there are also several varieties.

The American or white elm (*U. Americana*) is found from the 49th to the 30th parallel of latitude, is abundant in the Western States, and extends beyond the Mississippi, but attains its loftiest stature between lat. 42° and 46°; here it reaches the height of 100 feet, with a trunk 4 or 5 feet in diameter, rising sometimes 60 or 70 feet, when it separates into a few primary limbs, which are at first approximate, or cross each other, but gradually diverge, diffusing on all sides long, arched, pendulous branches, which float in the air. It has been pronounced by Michaux 'the most mag-

nificent vegetable of the temperate zone.' Its wood is not much esteemed.

The red or slippery elm (*U. fulva*) is found over a great extent of country in Canada, Missouri, and as far south as lat. 31°; it attains the height of 50 or 60 feet, with a trunk 15 or 20 inches in diameter; the wood is stronger and of a better quality than that of the white elm, is employed in constructing houses, and is good for blocks. The leaves and bark yield an abundant mucilage, to which it owes one of its names, and which is used as a remedy in coughs, and in dysentery and other bowel complaints.

The wahoo (*U. alata*) inhabits from lat. 37° to Florida, Louisiana, and Arkansas, and is a small tree, sometimes 30 feet high, remarkable from the branches being furnished, on two opposite sides, with wings of cork 2 or 3 lines wide; the wood is fine-grained, compact and heavy, and has been used for the naves of coach wheels.

ELMINA, or St. George del Mina, a town on the west coast of Africa belonging to the British, formerly the capital of the Dutch settlements on the Gold Coast, 5 or 6 miles west of Cape Coast Castle. There is here a large and excessively irregular and dirty native town, the inhabitants of which consist of traders, fishermen, and persons employed as servants to traders. Elmina is defended by a castle and sundry other defensive works. The castle of St. George del Mina was the first European establishment on the coast of Guinea, having been erected by the Portuguese in 1481. It was captured by the Dutch in 1637, was ceded to that nation by the crown of Portugal in 1641, together with some other smaller settlements, and finally to Britain in 1872 along with the other Dutch possessions.

ELMO'S FIRE, St., an appearance caused by fiery meteors in the atmosphere. It is often seen playing about the masts and rigging of ships. If two flames are visible (Castor and Pollux), the sailors consider it a good omen; if only one, which they call *Helena*, they regard it as a bad one.

ELMSHORN, a town, Prussia, Holstein, county of Rantzau, 20 miles north-west of Hamburg, a station on the Altona and Kiel Railway, and on the Krückau, a navigable stream which separates the old from the newer parts of the town. It possesses few vessels and little traffic on the river, but it has a boat-building yard and a considerable amount of land transit trade; also some tanneries; but boots and shoes are the principal articles manufactured, employing about 500 hands in the town. There are some charitable institutions and an important annual cattle-market. Pop. 6671.

ELMSLEY, Peter, D.D., an eminent scholar and philologist, was born in 1773, and educated at Oxford. Having inherited a fortune from his uncle he devoted the remainder of his life to literature. In 1802, being then resident in Edinburgh, he became one of the original contributors to the Edinburgh Review, in which the articles on Heyne's Homer, Schweighäuser's Athenæus, Blomfield's Prometheus, and Porson's Hecuba, are from his pen. He also wrote occasionally, at a subsequent period, in the Quarterly Review. In the pursuit of his philological studies Mr. Elmsley afterwards visited most of the principal libraries on the Continent, and spent the whole of the winter of 1818 in the Laurentian Library at Florence. The year following he accepted a commission from the government to superintend, in conjunction with Sir Humphrey Davy, the unrolling of the Herculanean papyri; in which the selection of the manuscripts was left to his judgment. On his return to England he settled at Oxford, and having taken the degree of Doctor of Divinity, obtained soon after the headship of Alban Hall and the Camden professorship in 1823. He died in 1825. He published editions of the following tragedies of Sophocles and Euripides: Œdipus Tyrannus (1811); Heraclidæ (1815); Medea (1818); Bacchæ (1821); and Œdipus Coloneus (1823).

EL OBEID. See Obeid.

ELOCUTION is the art by which, in delivering a discourse before an audience, the speaker is enabled, with greatest ease and certainty, to render it effective and impressive. The value of an elocutionary training to public speakers is very great, as well in sparing the voice, as in overcoming natural defects or provincialisms in delivery, and in cultivating and developing the natural taste. It is surprising that any public speaker should be left without the benefit of such a training, but in this country educational habits have hitherto made it the exception rather than the rule.

ÉLOGE (French) is a discourse pronounced in public in honour of the memory of an illustrious person recently deceased. In modern times the eloge is peculiarly a French institution, and has given rise to a quite distinct species of literature, which, though its style is not the most agreeable, is not altogether without utility, as the best éloges frequently contain rapid and summary views of the state of science, art, literature at a particular time, of the works of some distinguished author, the political events of a period, or whatever other theme may be suggested to the orator by the particular career of the subject of his eulogy. Such summaries, of course, considering the object with which they are made, must be received with great caution, but they frequently convey information not easily accessible in other ways. An éloge is pronounced over every member of the Academy when he dies, as the inaugural discourse of the new member who is chosen to succeed him. The abuses to which this style of composition is liable have given rise to burlesque and satirical éloges.

ELOHIM (plural of *Eloah*), one of the Hebrew names for God, of frequent occurrence in the Bible. Elohim is used in speaking both of the true God and of false gods, while Jehovah is confined to the true God. The plural form of Elohim has caused a good deal of controversy among critics. By some it has been considered as containing an allusion to the doctrine of the Trinity, others regard it as the plural of excellence, while others hold it as establishing the fact of a primitive polytheism. This word, along with Jehovah, has played a great part in modern criticism. Critics have professed to find in the comparative frequency of the two terms an evidence of the date of the manuscripts in which they occur; but on this controversy we cannot enter.

ELONGATION, Angle of, the angle that measures the apparent distance of two stars as seen from the earth. The term is, however, by usage confined exclusively to the distance of a planet from the sun, and of a satellite from its primary. When two fixed stars or two planets are spoken of, the word *distance* is employed.

ELOPEMENT, in law, is when a married woman, of her own accord, departs from her husband and dwells with an adulterer; for which, without voluntary reconciliation to the husband, she shall lose her dower. The term popularly denotes a runaway marriage.

ELPHINSTON, William, a celebrated Scottish prelate, founder of King's College, Aberdeen, was born at Glasgow in 1437. His father was an archdeacon of the Scottish Church, and the son was educated at Glasgow College, where he passed A.M. about his twentieth year. After applying himself to theology he was made priest of St. Michael's, Glasgow, where he served four years; then having gone

to France he studied law for three years, and was appointed professor of law, first at Paris and subsequently at Orleans. In 1471 he returned home at the request of his friends, particularly of Muirhead, bishop of Glasgow, who made him parson of the town and commissary of the diocese. On the decease of Muirhead, the Archbishop of Glasgow made him official or commissary of the Lothians, which office he continued to discharge till 1478. About the latter year he was sent with the Earl of Buchan on an embassy to France, and on his return in 1479 was made Archdeacon of Argyle. Soon after he was made Bishop of Ross; and in 1483 was transferred to the see of Aberdeen. In 1484 he was appointed a commissioner to treat of a truce and matrimonial alliance with England. On the defeat and death of Richard III. he was again sent in 1486 to negotiate a fresh truce with Henry VII. In 1488 he was made lord high-chancellor of the kingdom. In October of that year he assisted in the coronation of James IV. He was afterwards sent on a mission to Germany, and on his return was installed in the office of lord privy-seal, which he held till his death, which occurred on the 25th October, 1514. He wrote the Lives of the Scottish Saints, a work which has been lost; and a History of Scotland from the earliest period to his own time, which is preserved in the Bodleian Library at Oxford. It is said, however, to be little more than a copy of Fordun. He also made extensive compilations of the canon-law, which are preserved in the College of Aberdeen. In 1494 he obtained a papal bull for the erection of a university at Aberdeen.

ELPHINSTONE, The Honourable Mountstuart, governor of Bombay, was the fourth son of the eleventh Lord Elphinstone, and was born in 1778. He joined the Bengal civil service at the age of eighteen, and early became an *attaché* to the political resident at the court of the peishwa. He was attached to General Wellesley's mission to the Mahratta chiefs, and afterwards accompanied the general as aid-de-camp at the battle of Assaye. In 1808 he was intrusted with a mission to the courts of Cabul and Peshawur, and concluded an important treaty with Shah Shuja. Mr. Elphinstone published an account of this expedition. He was the British representative at the court of the peishwa in 1816, when the Marquis of Hastings took the command of the army against the Mahratta confederacy, was present at the battle of Kirkee, and was afterwards nominated sole British commissioner for the settlement of the peishwa's territories. He became governor of Bombay, to which the territories of the peishwa were attached, in 1819. During a government of seven years he established a code of laws, lightened taxes, and paid great attention to schools and public institutions. He left India in 1827. Among other acknowledgments of his government a college established by the natives was called after him Elphinstone College. On his return he wrote his History of India, which was published in 1841. He was offered the governor-generalship of India in 1835, and afterwards that of Canada, both of which he declined, as well as other honours which were placed at his disposal. He died 20th Nov. 1859.

ELSASS. See Alsace.

ELSASSER, Friedrich August, a distinguished German landscape-painter, born at Berlin, in 1810, of humble parentage. He early showed a very decided taste for art, obtained a free admission to the Academy, and after he had displayed his skill in some landscapes, was enabled to proceed to Rome, where he henceforth chiefly lived, working assiduously at his art, and studying music and modern languages. He undertook a laborious and even dangerous journey through Calabria, and industriously prosecuted his studies in unwholesome woods and ravines, where unfortunately he laid the foundation of a pulmonary complaint which ultimately brought him to the grave. After visiting the baths of Germany without any beneficial result, he died at Rome in 1845. Few have succeeded in depicting the peculiarities of a southern climate, the rich vegetation, the bright sky, the beautiful Italian back grounds, with so much truth and poetry.

ELSHOLTZ, Johann Sigismund, was born at Frankfort on the Oder, August 26, 1623. He studied there and at Wittenberg and Königsberg, travelled in Holland, France, and Italy, and became doctor at Padua, 1653. On his return to Germany he was nominated in 1656 court physician, and botanist to the garden then instituted at Berlin, posts which he held to the end of his life. He was the author of papers and works on botanical, medical, and chemical subjects; he carried on a discussion about transfusion, the discovery of which he claimed; wrote a book about distillation; and a paper on phosphorus, in which is noticed for the first time the phosphorescence of green fluor-spar. He died at Berlin in 1688.

ELSINORE, or Elsineur (Danish, *Helsingör*), a seaport town of Denmark, in the island of Seeland, at the narrowest part of the Sound, here only 3½ miles broad, 24 miles north by east of Copenhagen. It has two churches, a classical school, and a custom-house; its inhabitants are chiefly engaged in commerce and seafaring, and considerable traffic is carried on with Helsingborg, on the opposite coast, this being the chief point of transit between Denmark and Sweden. Elsinore is defended by the castle of Kronborg, built about 1580, which stands on a projecting spit of land, and commands the Sound. It is a Gothic-Byzantine edifice, built by Frederick II. in the boldest style, and is said to be one of the finest structures of its kind in Europe. It is now chiefly used as a prison, and was the place of confinement of the unfortunate Matilda, sister of George III. of England. From the summit of the lighthouse, showing a fixed light 113 feet high, the scene is of great beauty. Before the abolition of the Sound dues, compounded for in 1857 by the payment of £3,324,632, of which Great Britain contributed one-third, all merchant ships were bound to salute the castle, and to clear out at Elsinore, paying the toll. This charge was originally instituted for the purpose of keeping up lights and land-marks on the Cattegat and neighbouring coasts. Pop. (1870), 8891.

ELSTER, two German rivers.—1. The White, or Great Elster, rising in the west of Bohemia, flows north into Saxony, receives the Pleisse and Parde at Leipzig, and joins the Saale between Halle and Merseburg, after a course of about 115 miles.—2. The Black Elster, rising in Saxony, flows north into Prussia, then north-west, receives the Pulsnitz and Röder, and joins the Elbe between Wittenberg and Torgau, after a course of about 100 miles.

ELVAS, a town, Portugal, province of Alemtejo, near the Spanish frontier, 12 miles north-west of Badajoz. It occupies a central height flanked by two others, each of which is crowned by a castle, and is of such strength that it has been deemed all but impregnable. It consists generally of narrow crooked streets, but many of the houses, which are Moorish, have a picturesque and interesting appearance, with their arched fronts, latticed windows, and verandahs. The most remarkable structures are the cathedral, partly Moorish and partly Gothic, and the Moorish aqueduct, a magnificent work which brings water from a distance of 15 miles, and in the vicinity of the town crosses a valley on four tiers of arches, which have a total height of 250 feet. Pop. 11,088.

ELWES, JOHN, a celebrated miser, was born in Southwark about 1712. His own name was Meggot, but he changed it on succeeding to an estate left him by his uncle, Sir Harvey Elwes. He was educated at Westminster School, and afterwards visited the Continent; and in his younger days was noted for his skill in horsemanship and love of the chase. His stable and kennel of foxhounds were considered among the best in the kingdom, and yet he had only one servant to attend to them. Latterly his penuriousness increased to such an extent that he gave up his stud and denied himself every comfort, maintaining such a degree of parsimony as almost transcends belief. He never lighted a fire, wore his clothes till they dropped off in rags, and fed on all sorts of garbage, being one day observed to make a meal of part of a water-hen which a rat had left on the banks of a stream. In travelling he never entered an inn nor a carriage of any sort, and would carry with him for provisions two or three hard-boiled eggs and some crusts of bread. His constant fear was to die of poverty; and in this respect he seems to have been haunted by a true monomania, which may also partly explain his general miserly habits. In spite, however, of his penurious disposition he was singularly kind-hearted, ever ready to do any one a service even at great inconvenience to himself. It is said by those who knew him that he would lend his friends considerable sums, and then shortly afterwards haggle with a tradesman over a penny. From his influential position he was invited to stand as member for the county of Berks, and this he agreed to do on the express stipulation that his return should cost him nothing. He was elected in 1774. His fortune and his parsimonious habits increased in an equal ratio, and at his death in 1789 he left behind him a fortune of half a million, besides entailed estates, to his two natural sons.

ELY (Latin, *Elia* or *Helia*), an episcopal city, England, county and 15 miles N.N.E. of Cambridge, on an eminence on the left bank of the Ouse. It consists of one principal street, and several smaller branching off on either side, and has a spacious market-place in the centre. Some of the houses, particularly those in the vicinity of the cathedral, are very old, as their external appearance indicates. There are a commodious town-hall, a corn exchange, and a cattle market. The ecclesiastical structures comprise the cathedral, the churches of St. Mary and the Holy Trinity, the latter belonging to the time of Edward II., and one of the most perfect buildings of that age; besides places of worship for other sects. The cathedral is one of the most remarkable edifices of the kind in this country. It occupies the site of a monastery founded about the year 673 by Etheldreda, daughter of the King of East Anglia. Its entire length, east to west, is 517 feet, and its west tower, which is of the most beautiful workmanship, 270 feet high. The whole structure comprises an almost unbroken series of the various styles of architecture which prevailed in England from the Conquest to the Reformation, and so judiciously blended, and generally so perfect in their kind, as to produce no disagreeable effect by their admixture. The nave is Norman, and is one of the finest specimens of that style in England. This magnificent edifice has been for many years past undergoing extensive alterations, additions, and restorations, including an elaborate restoration of the choir, the opening of the tower, a new choir-screen, the decoration of the ceiling of the nave, and externally the erection of a new lantern upon the octagonal tower. A fine old gateway, of ample dimensions, built in the reign of Richard II., forms the principal entrance to the precincts of the cathedral. There are no manufactures worth noticing, most of the inhabitants being engaged in agricultural labour. There are extensive gardens in the vicinity, the produce of which is sent to London and Cambridge. Pop. 8166.

ELY, ISLE OF, a district in England, in the county of Cambridge, separated on the south by the Ouse from the remaining portion of the county. It is about 28 miles long by 25 miles broad; area, 227,326 acres. Pop. 66,333.—The name is now generally restricted to a smaller tract, about 7 miles long by 4 miles broad. It is surrounded by marsh, formerly covered by water. The soil is fertile, but requires a great deal of artificial draining. It produces marsh plants in great variety, and is much resorted to by aquatic birds.

ELYSIUM, ELYSIAN FIELDS, the name of certain regions which the ancients supposed to be the residence of the blessed after death. They are supposed by Homer to have been at the extremities of the earth; by Plato, at the antipodes; and by some of their successors, in the Fortunate Islands (the Canaries). But they gradually receded as the globe was explored, till they were at last transferred to the centre of the earth, in the kingdom of Pluto, which is Virgil's notion; according to other poets, they were situated in the sun or in the moon. The happiness of the blessed consisted in a life of tranquil enjoyment. The images by which the happiness of a residence there is described were taken partly from Olympus, and partly from descriptions of the golden age. The most beautiful meadows alternated with pleasant groves; a serene and cloudless sky was spread over them, and a soft celestial light shed a magical brilliancy over every object; the heroes there renewed their favourite sports; they exercised themselves in wrestling and other contests, danced to the sound of the lyre from which Orpheus drew the most enchanting tones, or wandered through odoriferous laurel groves, on the smiling banks of the Eridanus, in delightful vales, or in meadows watered by limpid fountains, amid the warbling of birds, sometimes alone and sometimes in company; a perpetual spring reigned there; the earth brought forth three times a year; and all cares, pains, and infirmities were banished from those happy seats. The voluptuous description of the gardens of Armida, in Tasso's Jerusalem Delivered, is an imitation of the ancient ideas of the Elysian fields.—The Parisians have called one of their favourite gardens and principal places of amusement *Champs-Elysées*.

ELYTRA, a kind of hard and bony case which incloses the wings of coleopterous insects or beetles. They are themselves wings, but are less important for flight than for protecting the true wings, formed of a fragile and gauze-like substance, when folded up beneath them and in a state of repose.

ELZEVIR, or ELZEVIER. This family of publishers and printers, residing at Amsterdam and Leyden, is celebrated for beautful editions, principally published from 1595 to 1680. The best known are LOUIS, MATTHEW, ABRAHAM (associated with Buonaventura), ISAAC (the first printer of the family), JOHN, and DANIEL, at Amsterdam and Leyden. Besides these was PETER ELZEVIR, at Utrecht, who has done less for the art. Louis was the first who made a distinction between the consonant *v* and the vowel *u*. Abraham and Buonaventura prepared the small editions of the classics, in 12mo and 16mo, which are still valued for their beauty and correctness. Daniel was one of the most active of this family. Although the Elzevirs were surpassed in learning, and in Greek and Hebrew editions, by the Stephenses (Etiennes, printers and booksellers at Paris), they were unequalled in their choice of works, and in the elegance of their typography. Their editions of Virgil, Terence,

the New Testament, the Psalter, &c., executed with red letters, are masterpieces of typography, both for correctness and beauty. See Brunet's Notice de la Collection des Auteurs, imprimés par les Elzevir, in the fifth vol. of the Manuel du Libraire, and Ch. Piéter's Annales de l'imprimerie des Elzevir (Ghent, 1860).

EMANATION, EFFLUX (from the Latin *emanare*, to issue, to flow out, to emanate). Philosophical systems, which, like most of the ancient, do not adopt a spontaneous creation of the universe by a Supreme Being, frequently explain the universe by an eternal emanation from the Supreme Being, as light is from the sun, without producing diminution of substance or power. This doctrine came from the East. Traces of it are found in the old Persian or Bactro-Median doctrine of Zoroaster. It had a powerful influence on the ancient Egyptian philosophy, as also on that of the Greeks, as may be seen in Pythagoras. The system was subsequently developed by Plotinus of Alexandria, and various modifications of it are maintained by the Gnostics, the Manicheans, and the Pantheists.—In theology, the doctrine of emanation is the doctrine of the Trinity, which regards the Son and Holy Ghost, &c., as effluxes from the Deity himself.

EMANCIPATION, in ancient Roman law, the act by which a minor was released from paternal authority. This was effected by a fictitious sale by the father of his son or daughter to a third party, who manumitted them. Females were emancipated by a single sale; but males did not attain their full freedom of action and responsibility until sold three times: usually the son was resold at last to the father, who set him free, and thus acquired the right of a patron. By the Code Napoléon, majority (and with it emancipation) is attained at the age of twenty-one, or in the event of the marriage of the minor. In the wide sense in which the word is now used it signifies release from an unjustifiable state of subjection.—In politics it signifies the granting of certain privileges to those from whom they have been kept owing to difference of nationality, sex, creed, &c. See CATHOLIC EMANCIPATION and SLAVERY.

EMANUEL THE GREAT, King of Portugal, ascended the throne in 1495. During his reign were performed the voyages of discovery of Vasco da Gama, of Cabral, of Americus Vespucius, and the heroic exploits of Albuquerque, by whose exertions a passage was found to the East Indies (for which the way was prepared by the discovery of the Cape of Good Hope, in 1486, by Bartolomeo Dias), the Portuguese dominion in Goa was established, the Brazils, the Moluccas, &c., were discovered. The commerce of Portugal, under Emanuel, was more prosperous than at any former period. The treasures of America flowed into Lisbon, and the reign of Emanuel was justly called 'the golden age of Portugal.' He died in 1521, aged fifty-two, deeply lamented by his subjects, but hated by the Moors and the Jews, whom he had expelled. As a monument of his discoveries, Emanuel built the monastery at Belem, where he was buried. He was a friend to the sciences, and to learned men. He left Memoirs on the Indies.

EMBALMING, to embalm, to fill and surround with aromatic, desiccative, and antiseptic substances any bodies, particularly corpses, in order to preserve them from corruption. The ancient Egyptians employed the art on a great scale, and other peoples, for example the Assyrians, Scythians, and Persians, followed them, but by no means equalled them in it. The ancient Peruvians appear to have injected and washed the corpses with the fluid that flows from imperfectly burned wood, which would of course contain pyroligneous acid, creosote, and other antiseptics. Pliny alludes to the use of a similar fluid by the Egyptians for embalming. The art has degenerated very much from the high degree of perfection at which it stood among the ancients, perhaps because the embalming of the dead is less frequent; but by processes now known, embalming can be performed more perfectly, and in a much shorter period, than by that of early times.

The intestines are taken out of the body and the brains out of the head, and the cavities filled up with a mixture of balsamic herbs, myrrh, and others of the same kind; the large blood-vessels and other vessels are injected with balsams dissolved in spirits of wine; the body is rubbed hard with spirits of the same kind, &c. (See MUMMIES.) The ancient Egyptians removed the viscera from the large cavities, and replaced them with aromatic, saline, and bituminous substances, and also enveloped the outside of the body in cloths impregnated with similar materials. These were useful in preventing decomposition and excluding insects until perfect dryness took place.

In later times bodies have been preserved a long time by embalming, especially when they have remained at a low and uniform temperature, and have been protected from the air. The body of Edward I. was buried in Westminster Abbey in 1307, and in 1770 was found entire. Canute died in 1036; his body was found very fresh in 1776, in Winchester Cathedral. The bodies of William the Conqueror and of Matilda his wife were found entire at Caen in the sixteenth century. Similar cases are not unfrequent.

In many instances bodies not embalmed have been preserved from decay merely by the exclusion of the air and the lowness of the temperature, and also by the place in which they are kept. Certain caverns and vaults are reported to have this preservative effect, such as the vaults at Dublin, the Cordeliers Cemetery at Toulouse, and especially the famous Capuchin burying-vaults near Palermo. It is said, however, that in the last instance, whatever may have been the power of the vault at one time, the bodies are now treated with corrosive sublimate before they are deposited there. Impregnation of the animal body with corrosive sublimate, indeed, appears to be one of the most effectual means of preserving it, excepting immersion in spirits. The impregnation is performed by the injection of a strong solution, consisting of about 4 oz. of bichloride of mercury to a pint of alcohol, into the blood-vessels, and, after the viscera are removed, the body is immersed for three months in the same solution, after which it dries easily, and is almost imperishable. *Wet preparations*, or those immersed in alcohol or oil of turpentine, last for an indefinite time.

Messrs. Capron and Boniface, two chemists of Chaillot in France, in 1832 made an important discovery, by which they can preserve the human figure in a manner superior to any hitherto practised. By a process which they keep secret, and to which they have given the name of 'Momification,' they have succeeded, after experimenting for many years, in so modifying and perfecting the known process of preserving bodies as to reduce them to mummies, leaving all the forms unaltered. All the elements of disorganization which show themselves in the human body so soon after death are completely destroyed, and not only the external body, but all the viscera, the lungs, the heart, the liver, and even the brain, are perfectly preserved. The operation requires but a very few days, after which the dead bodies may be kept in a room or a vault, or interred in the ordinary way, without being accessible to worms. They may be exposed to all the varieties of air, either in a standing

or sitting posture, without undergoing any alteration. At a meeting of the Académie des Sciences a human body and two hearts, preserved in this manner, were exhibited, and the process appeared perfect; yet it has been excelled by that of M. Gannal, who uses aluminic chloride.

EMBANKMENT, a mound of earth, &c., thrown up for the purpose of forming a roadway at a level different from that of the natural surface of the ground, or for keeping a large body of water within certain limits. The main conditions of embankments are: (1.) That the slopes are such as should be permanent. It is found, in executing embankments required for supporting railways or ordinary roads, or those which have merely to support a vertical weight, that the slope required to be given to loose rubble, chalk, stone, loamy sand, or gravel, corresponds to about 1½ base to 1 vertical; dry, loose sand and ordinary clay should have about 2 horizontal to 1 vertical. Some clays would require a much wider base. A bank faced with stone may, of course, be built with safety at a much higher angle. (2.) That the embankment should not slip vertically, as when erected on marshy or peaty soils. Various plans have been adopted in cases of this nature. In Holland the weight of the heart of the embankment is diminished by introducing layers of reeds or fascines; in other parts of the Continent pits are sunk in the subsoil at short distances from each other, and filled with incompressible materials; in other instances the mounds have been raised upon a bed of concrete, or sand prevented from spreading laterally. Piling is also a successful method. (3.) The embankment must be prevented from slipping laterally. This may be effected by forming steps in the earth of the subsoil, or by cutting deep trenches at the feet of the respective slopes. This has the further advantage of preventing the passage of water between the soil and the seat of the mound. In cases where embankments are raised for the storage of water, it is imperative to insert a 'puddle-dike,' that is, a water-tight wall, through the whole depth of the bank down to the impermeable strata beneath. To resist the action of wind and rain, or of the waters of a slow-flowing stream, the bank should in all possible cases be covered with turf; when, however, the action of the water is violent, the expensive processes of stone pitching or piling must be resorted to. The largest embankments hitherto executed are those on the banks of the Po, the Loire, the Rhine, the Meuse, the Scheldt, the Thames, the Ouse; on the shores of Zealand, Holland, Friesland; the Oberhäuser embankment on the Augsburg and Lindau Railway, the Gadelbach cutting on the Ulm and Augsburg line, and the Tring cutting on the North-western Railway.

EMBARGO, in commerce, an arrest on ships or merchandise, by public authority; or a prohibition of state, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both for a limited time. A breach of embargo, under knowledge of the insured, discharges the underwriters of all liability.

EMBASSY, in its strict sense, signifies a mission presided over by an ambassador, as distinguished from a legation or mission intrusted to an envoy or consul. The difference between the powers and privileges of an ambassador and an envoy is, that the former, as the representative of the person of his sovereign, can demand a private audience of the sovereign to whom he is accredited, while the latter must communicate with the minister for foreign affairs.—In the popular sense, the word signifies any diplomatic mission whatever.

EMBAYED, the situation of a ship when she is inclosed between two capes or promontories. It is particularly applied when the wind, by blowing strong into any bay or gulf, makes it extremely difficult, and perhaps impracticable, for the vessel thus inclosed to draw off from the shore so as to weather the capes and gain the offing.

EMBER-DAYS, in the Roman Catholic Church, are certain seasons of the year set apart for the imploring God's blessing, by prayer and fasting, upon the fruits of the earth, and the ordinations performed in the church at such times. The ember-days were formerly observed in different churches with some variety, but were at last settled as they are now observed by the council at Placentia, in 1095. They occur four times a year, being the Wednesday, Friday, and Saturday after the first Sunday in Lent, after the feast of Pentecost or Whitsunday, after the festival of the Holy Cross (14th Sept.), and after the festival of St. Lucia (13th Dec.) The weeks in which these days fall are called *Ember-weeks*.

EMBEZZLEMENT is the appropriation, by a clerk or servant, to himself, of money or property put into his hands in trust. An embezzlement is both a theft and breach of trust; yet, by the general law, it is only a ground for an action for the value of the property. But there are many special provisions in relation to particular embezzlements and breaches of trust. By the law of England, a clerk guilty of embezzlement is liable to transportation not exceeding fourteen years; and a public servant or agent committing the like offence is declared guilty of a misdemeanor, and punishable at the discretion of the court. Still more severe provisions are made in the case of embezzlement by the officers and clerks of banks. Partners stealing money, &c., belonging to the copartnership may be convicted and punished as if they had not been such partners.

EMBLEM (Greek, *emblēma*, from *emballein*, to cast in, to insert). Originally this word was used to designate all kinds of inlaid or mosaic work; it is now applied to a picture representing one thing to the eye and another to the understanding. The meaning of the emblem rests on its secondary, not its primary signification. The most common emblems are such as a balance, which represents justice; a crown, an emblem of royalty; the serpent, of cunning; the dove, of innocence, &c.

EMBLEMENTS (from the old French *emblarance de bled*, corn sprung or put above ground), a term applied to the growing crops of land when the lease of a tenant for life has expired by the death of the tenant, or when an estate at will has been determined by the lessor. In either case the emblements belong to the tenant or his executors. But when the estate is determined by the lease itself, as when there is an estate for a term of years, or when the tenant puts an end to his occupation by his own voluntary act, he will not be entitled to the crops, for the law does not relieve from voluntary obligations. Growing crops may be distrained for rent, and sold when ripe.

EMBOSSING, the art of producing raised figures upon plane surfaces, such as on leather for book-binding, &c.; on paper for envelopes, &c.; on wood or bronze, in architecture or sculpture. In the two last-mentioned arts, in proportion as the figures are more or less prominent, they are said to be in *alto*, *mezzo*, or *basso rilievo* (high, half, or low relief). Leather, paper, and textile fabrics are embossed by powerful presses furnished with dies of the desired pattern. Mr. Straker, of London, introduced in 1824 an ingenious method of embossing wood. The parts intended to be in relief are sunk by the application of a blunt steel tool as deep into the wood as they are intended to be raised above the surface,

care being taken not to injure the grain of the wood. The surface is then planed down to the level of the depressions; the wood is afterwards placed in water, and the compressed parts rise to their original level, and the work is finished by carving as ordinarily practised.

EMBRACERY, an attempt to corrupt or influence a jury by money, promises, letters, threats, or persuasions, whether the jury give a verdict or not, or whether the verdict given be true or false; which is punished by fine and imprisonment.

EMBRASURE, in fortification, an opening made in the breastwork or parapet of a battery or fortress, to admit of a gun being fired through it.

EMBROCATION, a lotion or combination of medicinal liquids, with which any diseased part is rubbed or washed.

EMBROIDERY, figured work in gold, or silver, or silk thread, wrought by the needle, upon cloths, stuffs, or muslins. In embroidering stuffs, a kind of stretching-frame is used, because the more the piece is stretched the easier it is worked. Muslin is spread upon a pattern, ready designed, and sometimes, before it is stretched upon the pattern, it is starched to make it more easy to handle. The art of embroidery was invented in the East, probably by the Phrygians. In Moses' time Aholiab, of the tribe of Dan, was noted for skill in embroidery, and the women of Sidon, before the Trojan war, excelled in the same art. Though the Greeks attributed the invention of the art to Minerva, yet it is certain that it came through the Persians to Greece. The King of Pergamus (Attalus), in the year of Rome 621, invented the mode of embroidering with gold thread. In modern times the art has been much extended, and in some parts gives employment to considerable numbers of people.

EMBRUN (ancient, *Eburodunum Caturigum*), a town, France, department of Hautes-Alpes, on a rocky eminence in the centre of a large plain watered by the Durance, 20 miles east from Gap; pop. 4183. It is an ancient place, surrounded by walls and ditches, and of very picturesque appearance, though the streets are irregular, dark, and crooked. It was pillaged successively by Vandals, Huns, and Saxons, and its inhabitants almost exterminated by the Moors in 966. It is still a bishop's, and was once an archbishop's see, and has a beautiful cathedral with a lofty spire.

EMBRYO, the first rudiments of the animal in the womb, before the several members are distinctly formed, after which it is called the *fœtus*. The time necessary to produce this is different in different species. The human embryo is visible in three weeks: at the end of four, a pulsation is perceptible, which is known to be the beating of the heart. It is now about the size of an ant or fly, and retains its transparency, which, however, gradually diminishes, and at the end of two months disappears: the eyes, nose, mouth, ears, and all the members, are distinguishable: it is as large as a bee. In three months everything becomes more distinct; the sex becomes evident, and the fœtus grows until it is ushered into the world as a child.

EMBRYOLOGY. The history of animals, from the first appearance of organization in the egg up to the attainment of the perfect form at or shortly after their escape from the egg, is ascertained by embryology, a field of inquiry which only the great perfection of modern instruments has allowed to attain its present rank. The importance of the study depends upon this, that the history of animals thus traced reveals the existence of structures which disappear at a later period, or become obscured by arrest of their development, or by union with other parts, and permits us to follow the steps by which complex organs arise by the combination of simpler parts. Thus resemblances are detected, points of affinity recognized between species and orders whose adult aspect is very unlike. In the crustaceans, for example, the barnacles (Cirrhipedia) were placed among molluscs when classification was based on external features: it is now known that they pass through embryonic stages in which they agree in form with the young of other crustaceans; that they are, in fact, crustaceans which, as they approach maturity, become modified, and ultimately are adapted for an exclusively sedentary life. It also appears that this *zoëa* stage is met with more or less distinctly marked in all crustaceans; but that in some it disappears early, as in the crabs; in others, as the copepods, the adult still retains the general aspect. The dates at which these common embryonic characters are lost furnish a guide to classification, since presumably an adult departs farther from its earlier form the more complex is its structure, and the more highly specialized are its organs. Thus the lobster retains the elongated flexible abdomen of one zoëal stage, that of the *Megalops*, while in the crab the abdomen ceases to enlarge after a time, and ultimately becomes an appendage no longer useful for swimming. Similarly the fish retains throughout life the gills which the frog loses in the tadpole stage; while reptiles, birds, and mammals exhibit, in their embryonic state, the clefts separating these processes to which the gills were attached in the lower forms. The embryonic development of insects and other articulated animals proves that the highly altered organs around the mouth which serve as masticatory or suctorial apparatus, are in their earliest condition identical with the locomotive limbs, but become specialized as development advances. In those classifications which set forth the relationships of animals by descent, the common embryonic characters are held to exist in the descendants from a common stock, and the relative dates of their disappearance to correspond to their successive divergences from that stock. Thus the crab would represent an earlier commencement of specialization than the lobster, and both are earlier divergences from the primitive type than the Copepods and Entomostracans, which are nearer to the zoëa form. But apart from such speculations, embryology is becoming a most important element in classification since the characters of an animal are not those of its adult state merely, but must include all the structural features which it presents at every period of its life.

EMDEN (Latin, *Amisia*), a town of Prussia, in the province of Hanover, on the right bank of the Ems, near where it discharges itself into the Dollart estuary. It has very much the appearance of a Dutch town, occupying a low flat intersected by numerous canals, across which the communication is maintained by thirty bridges. It was originally surrounded by ramparts and ditches. The part of the former which still remains is used as a promenade. Towards the water a strong wall and dike have been constructed to prevent inundation. The town is entered by four gates. The streets are, for the most part, spacious, and well paved; and the houses, built generally of brick, have a substantial, comfortable look. The principal buildings are the great church, built in 1455, surmounted by a lofty tower; the new church, the French Reformed church, the townhouse, with a lofty tower and a spacious hall; the court-house, weigh-house, custom-house, spinnhaus, or house of correction, and barracks. Emden has as excellent roadstead, in which vessels of any size can securely anchor. The port, consisting of an outer and two inner harbours, is shallow. Canals

connect the town with the harbour. Its export trade includes grain, dairy produce, gin, tallow, wool, and hides; and it imports hemp, potash, timber, wine, and colonial produce. In the building yards a considerable number of vessels are annually built; and the manufactures, though far less important than the trade, include hosiery, leather, brown soap, and tobacco. There are also oil-mills, breweries, and distilleries. Pop. 12,558.

EMERALD is a well-known gem of pure green colour, somewhat harder than quartz. It is a silicate of aluminium and the rare element glucinum or beryllium, which was detected in it by Vauquelin, after it had been discovered by the same chemist in the beryl. Its natural form is either rounded or that of a short six-sided prism. It is a little harder than quartz, and has a specific gravity 2·67 to 2·73. It is not acted on by acids. By the ancients the emerald was in great request, particularly for engraving upon. They are said to have procured it from Ethiopia and Egypt. The most intensely coloured and valuable emeralds that we are acquainted with are brought from Peru. They are there found in a peculiar limestone, and in other localities in mica slate. The emerald is one of the softest of the precious stones, and is almost exclusively indebted for its value to its charming colour. By some this colour is ascribed to traces of chromium, by others to the presence of organic matter; but it seems now certain that it is really due to chromium. In value it is rated next to the ruby, and, when of good colour, it is set without foil, and upon a black ground, like brilliant diamonds. Emeralds of inferior lustre are generally set upon a green gold foil. These gems are considered to appear to greatest advantage when table-cut and surrounded by brilliants, the lustre of which contrasts well with the green of the emerald. They are sometimes formed into pear-shaped ear-drops; but the most valuable stones are generally set in rings. A favourite mode of setting emeralds, among the opulent inhabitants of South America, is to make them up into clusters of artificial flowers on gold stems. The largest emerald that has been mentioned is one said to have been possessed by the inhabitants of the Valley of Manta, in Peru, at the time when the Spaniards first arrived there. It is recorded to have been as big as an ostrich's egg, and to have been worshipped by the Peruvians under the name of the *goddess or mother of emeralds*. They brought smaller ones as offerings to it, which the priests distinguished by the appellation of *daughters*. Many fine emeralds are stated to have formerly been bequeathed to different monasteries on the Continent, but the greatest part of them are said to have been sold by the monks, and to have had their place supplied with coloured glass imitations. These stones are seldom seen of large size, and at the same time entirely free from flaws. The emerald, if heated to a certain degree, assumes a blue colour, but it recovers its own proper tint when cold. When the heat is carried much beyond this it melts into an opaque, colourless mass. When fused with borax the bead acquires a green colour. The oriental emerald is a variety of the ruby, of a green colour, and is an extremely rare gem. See BERYL.

EMERALD GREEN, known also as SCHWEINFURTH GREEN, and by a great number of other names, is one of the most beautiful green pigments. The exact chemical composition has not been definitely established, and there may be variations according to the mode of preparation adopted; but it appears to contain copper, arsenic, and acetic acid, and is usually regarded as an aceto-arsenite of copper. It is a crystalline powder, which becomes paler by grinding, is not affected by light and air, and is insoluble in water, but is decomposed by alkalies. It is used both as a water and as an oil colour, and it is often printed upon wall-papers. It is an extremely poisonous substance.

EMERY, an impure variety of corundum, of blackish or bluish-gray colour, is chiefly found in shapeless masses and mixed with other minerals. It contains about 90 per cent. of alumina, and a small portion of iron, is usually opaque, and about four times as heavy as water. It is very tough; is infusible, and is not attacked by acids. The best emery is brought from the Levant, and chiefly from Cape Emeri in Naxos, and from other islands of the Grecian Archipelago. It is also found in some parts of Spain, and is obtained from a few of the iron mines in Great Britain. In hardness it is about half that of adamantine spar, and it is this property which has rendered it an object of such request in various arts. It is employed by lapidaries in the cutting and polishing of precious stones; by opticians in smoothing the surface of the finer kinds of lenses, preparatory to their being polished; by cutlers and other manufacturers of iron and steel instruments; by masons in the polishing of marble; and in their respective trades by locksmiths, glaziers, and other artisans. For all these purposes it is pulverized in large iron mortars or in steel mills, and the powder, which is rough and sharp, is carefully washed and sorted into eight or ten different degrees of fineness, by passing it through sieves of a definite number of wires. The sifting is usually performed by those who use it, according to the description of work in which it is to be employed. Emery-paper and emery-cloth are made by laying a thin coat of glue upon the fabric, and dusting the emery from a sieve of the required size. It has also been made into cakes by mixing it with melted bees'-wax; a mixture of it with paper pulp has been used for razor-strops; and with vulcanized india-rubber for sharpening scythes and sickles.

EMETIC (*emeticus*; from Greek *emein*, to vomit), that which is capable of exciting vomiting, independently of any effect arising from the mere quantity of matter introduced into the stomach, or of any nauseous taste or flavour. The susceptibility of vomiting is very different in different individuals, and is often considerably varied by disease. Emetics are employed in many diseases. When any morbid affection depends upon, or is connected with over-distension of the stomach, or the presence of acrid, indigestible matters, vomiting gives speedy relief. Hence its utility in impaired appetite, acidity in the stomach, in intoxication, and where poisons have been swallowed. In the different varieties of febrile affections, much advantage is derived from exciting vomiting, especially in the very commencement of the disease. In high inflammatory fever it is considered as dangerous, and in the advanced stage of typhus it is prejudicial. Emetics, given in such doses as only to excite nausea, have been found useful in restraining hæmorrhage. Different species of dropsy have been cured by vomiting, from its having excited absorption. To the same effect, perhaps, is owing the dispersion of various swellings, which has occasionally resulted from this operation. The operation of vomiting is dangerous or hurtful in the following cases: where there is determination of the blood to the head, especially in plethoric habits; in visceral inflammation; in the advanced stage of pregnancy; in hernia and prolapsus uteri; and wherever there exists extreme general debility. The frequent use of emetics weakens the tone of the stomach, and should never be resorted to, but in cases of extreme urgency. An emetic should always be administered in the fluid form. Its operation may be promoted by drinking any tepid diluent or bitter infusion.

EMETINE is a peculiar vegetable principle, obtained from the ipecacuan root, of whose emetic properties it is conceived to be the cause. It is obtained by digesting the root first in ether and then in alcohol. The alcoholic infusion is evaporated to dryness; and to the residuum, re-dissolved in water, acetate of lead is added, which produces a precipitate. The precipitate is washed, diffused in water, and decomposed by a current of sulphuretted hydrogen gas. Sulphuret of lead falls to the bottom, and the emetine remains in solution. By evaporating the supernatant fluid this substance is obtained pure. There are several other ways of preparing it, but when got quite pure it is a white, odourless, uncrystalline powder, with a bitter, acrid taste. It is sparingly soluble in water, readily in alcohol and chloroform. It has an alkaline reaction, and combines with acids, forming uncrystallizable salts. In a dose of half a grain it acts as a powerful emetic, followed by sleep; six grains produce violent vomiting, stupor, and death. An impure extract, of a brown colour, is also employed, and that more frequently than the emetine itself.

EMEU, Emu, or New Holland Cassowary. See Cassowary.

EMIGRATION, removal from one country to another, for the purpose of permanent residence. The impulse to leave the native country may spring from very different causes, the principal of which we shall endeavour to state. The prime cause is over-population. It must be borne in mind, however, that the mere statistics of inhabitants to a square mile are no index of excess of population. In this matter all depends not only on the extent and fertility of the soil, but on the labour and intelligence of the inhabitants, and on the social and political constitution. Emigration is often influenced by particular and temporary incidents, such as a bad harvest, an industrial crisis, a religious or political movement, the creation of a new colony, and more rarely by the desire to escape from laws which prohibit both marriage and the acquisition of land under certain circumstances, and from compulsory military service. The migrations of the barbarous ages admit of a very simple explanation; a tribe, after having exhausted the tract on which it had established itself, removed to a more tempting territory. Among the Greeks and Romans more complex influences were at work. The various states of ancient Greece possessed but a very limited territory, and whenever the population in any one of them increased beyond what the territory could easily nourish, a portion of the inhabitants was sent out to found an independent state. At Rome emigration was the consequence of the social and political institutions. In spite of the agrarian laws, which divided the land among the citizens, it soon fell into the hands of a few proprietors; and as the trades and professions were generally exercised by slaves, the majority of the free population had no source of income. Hence the numerous revolts, embittered by the ambition of the tribunes. The senate and the aristocracy endeavoured to get over the difficulty by giving the Roman citizens portions of conquered territory in Italy and elsewhere. These characteristics of emigration are not met with in the middle ages. On the one hand, Europe, after the fall of the Roman Empire and the conquest of the Asiatic invaders, did not suffer from over-population; and on the other, the feudal system confined the people to the glebe, or within the insuperable limits of a corporation. On the discovery of America the long stagnation of the population of Europe came to an end. At first love of adventure, of plunder, the tales of rich gold and silver mines, drew many to the New World; but as they intended to return to spend their wealth and remaining days at home, they can scarcely be looked on as emigrants. Emigration, in its proper sense, to America, commenced with the departure of the Puritans who colonized New England; they were followed by the Germans, who settled principally in Pennsylvania; the Dutch colonized New York; the Swedes Delaware; the French Canada and Louisiana. Still the current of emigration was slow until 1815, when it acquired such magnitude and force that statesmen began to debate seriously its advantages and disadvantages. It was not long, however, till the logic of events proved it to be both irrepressible and advantageous. It was recognized that every fresh colony extended the national, political, and social influence; that they opened new markets for the productions of the mother country, giving at same time fresh impetus to maritime trade, and that they formed safe outlets for an impoverished or overcrowded population. English statesmen were the first to see the inutility and danger in restraining the tide of emigration, and they either repealed or allowed to become obsolete the acts forbidding the emigration of various sections of the community. The British government superintends the emigration from this country, through the Colonial Land and Emigration Commissioners. The duties of these may be divided into three classes: the sale of colonial lands, the supervision and promotion of emigration, and the diffusion of information with respect to the colonies. The board endeavours to protect poor emigrants from imposition, and from the effects of improvident arrangements on their part, and takes care that the provisions of the Passengers Acts are duly carried out and enforced. They publish information with regard to the settlement of waste land in the colonies, and to the rate of wages to be obtained, the prices of food and clothing, &c., in the colonies. They also afford all information in their power to any person who may apply to them personally or by letter. The British government does not further assist emigrants, but the governments of some of the colonies have been in the habit of granting money to enable suitable persons in poor circumstances to emigrate to those colonies.

From England, Scotland, and Ireland, a large emigration takes places to the United States, to Canada, Australia, Van Diemen's Land, New Zealand, Cape of Good Hope, &c.; from Germany, Switzerland, Sweden, and Norway, to North America, and considerable numbers also to South America; and of Chinese, to Australia and the United States.

The Thirty-second General Report of the Emigration Commissioners informs us that in the fifty-seven years, from 1815 to 1871 inclusive, there left the United Kingdom 7,266,072 emigrants, of whom 4,671,515 went to the United States of America; 2,425,092 to British colonies (viz. 1,424,442 to the North American colonies, 1,000,650 to the Australian colonies and New Zealand); and 169,165 to other places. The average annual emigration from the United Kingdom was 127,475 for the same fifty-seven years, and 212,823 for the ten years ending 1871. The nationality of the emigrants from the United Kingdom in 1871, as compared with 1869 and 1870, is shown in the following table:—

	1871.	1870.	1869.
English	90,416	105,293	102,452
Scotch	22,599	22,935	19,232
Irish	73,325	74,283	71,047
Foreigners	65,752	48,396	53,246
Not distinguished	5,975	6,033	6,438
Total	258,027	256,940	252,435

The destination of the emigrants who were natives

of the United Kingdom is shown in the following table:—

	English.	Scotch.	Irish.
United States	71,926	13,271	65,591
N. American Colonies	13,285	3,608	3,061
Australian Colonies	7,960	1,720	2,015
Other Places	4,281	633	400

The United States absorb the greater part of the emigration from Europe, and have done for many years.

ÉMIGRÉS (emigrants). We meet in history with many instances of large bodies of men being obliged to leave their country on account of religious persecutions, as did the Huguenots, for instance, in the seventeenth century, or for some other causes. The appellation of *émigrés*, however, is now applied to those persons particularly who left France at the commencement of the first French revolution. These persons, some from enmity to the new order of things, others to escape political persecution, removed into the neighbouring countries, some with a little property, which they had found means to carry off, others entirely destitute. They were from all ranks, and of all ages and conditions. Most of them hoped to see the restoration of the old order, by which they might be enabled to return to their country, and therefore remained at first on the frontiers. Among them were seen examples of the basest profligacy and the most heroic self-denial. Persons who had been accustomed to all the luxuries of life, and the refinements of rank, earned a scanty subsistence in petty employments, and bore their privations with dignity and resignation. It would be unjust to call all those who left their country to its fate in the time of its greatest peril, weak and timid; for where anarchy rules the innocent is not secure. The emigration, however, of the royal princes can hardly be justified. Their presence was of great importance to the state, and their example contributed not a little to the extensive emigration which followed, and the injurious consequences which attended it. At the head of the emigrants stood the royal princes of Condé, Provence, and Artois, the first of whom collected a part of the fugitives to co-operate with the allied armies in Germany for the restoration of the monarchy. At Coblentz a particular court of justice was established to settle causes relating to the French *émigrés*. As a body, they are described by contemporary authors as haughty in their deportment towards foreigners, and acting as if they constituted the French nation, and as if the rest of Europe did nothing more than its duty in assisting them to recover their estates and feudal rights. But the invasion of the Netherlands by Dumouriez drove them from these provinces in mid-winter in a deplorable condition, while their number was daily increased by the system of violence and terror carried on in France. The corps of Condé was finally taken into the Russian service, and was disbanded in the Russian-Austrian campaign of 1799. When Napoleon became emperor it was one of his first acts of grace to grant permission to all but a few of the emigrants to return to their country. Many, however, who by this time had settled in foreign places, did not choose to avail themselves of the indulgence.

EMINENCE (from the Latin *eminentia*), an honorary title, like excellency, and given to cardinals. They were formerly called *illustrissimi* and *reverendissimi;* but Pope Urban VIII. (of the Barberini family), in 1630 established the above as their title of honour. Popes John VIII. and Gregory VII. gave this title to the kings of France. Emperors have borne it.

EMIR (*i.e.* noble, princely), a title of honour given in Turkey to those who claim descent from Mohammed and his daughter Fatima. These emirs are found—1. In Arabia, where they are the chieftains of the wandering tribes, or Bedouins. Their origin, however, is doubtful. 2. In Turkey itself they form a kind of hereditary nobility, and wear as a badge a green turban, as Mohammed is said to have done. They have certain privileges, but otherwise no higher claims to civil offices than other Mussulmans. The word *emir* is also applied to certain offices and employments, for example, *emir hadji*, conductor of the pilgrims to Mecca; *emir-akhor*, commander of the Turkish horse; *emir-bazar*, overseer of the markets, &c. The title *emir-al-mumenin*, commander of the faithful, was borne by the caliphs.

EMMERICH, a town, Rhenish Prussia, on the right bank of the Rhine, 5 miles N.E. of Cleves. It is inclosed by walls and ditches, contains several churches, a gymnasium, ecclesiastical seminary, and orphan hospital; and has manufactures of woollen and linen cloth, hosiery, leather, &c.; some shipping, and a free port, at which an active trade is carried on, chiefly with Holland. Pop. 7817.

EMMET, ROBERT, a celebrated character in connection with the troubles in Ireland in the commencement of the present century, was born at Cork in 1780. He was originally intended for the bar, and with that view studied at Trinity College, Dublin, from which, however, in 1798, he was expelled, on the ground of exciting disaffection and rebellion. Subsequently to this he became an object of suspicion to the government, and accordingly quitted Ireland, but returned there again on the repeal of the suspension of the Habeas Corpus Act. He now became a member of the Society of United Irishmen, whose object was the chimerical idea of establishing the independence of Ireland. In July, 1803, he was the ringleader in the rebellion in which Lord Kilwarden and several other persons perished, but which was almost immediately suppressed. Emmet was arrested a few days afterwards, tried, and executed by a sentence of the royal commission. His fate excited considerable interest, from the circumstance of his attachment to Miss Sarah Curran, daughter of the celebrated barrister. Moore has immortalized his memory and that of Miss Curran in the beautiful song beginning, 'She is far from the land where her young hero sleeps.'

EMOLLIENTS, medicines of an oleaginous, saponaceous, or emulsive character, applied to surfaces, generally external, to soften and relax their fibres, as poultices, fomentations, &c.

EMOTION, one of the threefold divisions of the human mind, the other two being volition and intellect. There are three distinct kinds of emotion · pleasure, pain, and an excitement that partakes of the nature of neither. It is a generally recognized fact that pleasurable emotions have a healthy physical effect, and those of pain an unhealthy one; also, that both kinds, when experienced in the intensest degree, have frequently proved fatal. Every strong feeling has a certain outward expression. Under violent emotion the whole muscles of the body may be effected, but in less extreme cases the expression is confined to the three centres of movement of the face —viz. the mouth, the eyes, and the nose; the first being the most expressive of the three. Besides the features, the voice is instinctively affected. The organic functions of the system are also considerably influenced under emotion; the flow of tears from the eyes under the pressure of joy or grief, the cold perspiration from the skin in cases of fear; the quickened circulation of blood, the increased or diminished respiration, are effected by similar causes. The emo-

tions of the human mind may be further classified under two heads—first, the modes of excitement arising from the exercise of the senses, the appetites, and muscular action; and second, those not directly springing from sensation, yet connected with it. See Bell's Anatomy of Expression; Darwin's Expressions of the Emotions of Man and Animals; Bain on the Emotions and the Will.

EMPANNEL, the entering of the names of the jurors returned by the sheriff to pass upon a trial, into a schedule, roll, or page of a book, called the panel.

EMPEDOCLES, a Greek philosopher, whose doctrines in many respects resembled those of Pythagoras, was born about 460 B.C. at Agrigentum, in Sicily. His fellow-citizens esteemed him so highly that they wished to make him king; but being an enemy to all political forms which elevate a few above their fellows, he refused their offer, and prevailed on them to abolish aristocracy, and introduce a democratical form of government. The Agrigentines regarded him with the highest veneration, as the restorer and preserver of their liberty, the public benefactor, the great poet, orator, and physician, the favourite of the gods, the predicter of future events, and the mighty magician who could stop the course of nature, and overrule the power of death itself. Aristotle states that he died in obscurity, at the age of sixty years, in the Peloponnesus, but there are various legends respecting the manner and place of his death. He is said to have thrown himself into the crater of Mount Etna, in order to make it believed, by his sudden disappearance, that he was of divine origin. According to others, he was a victim to his rash curiosity, when, in order to examine more accurately the nature of the mountain, and of its fiery eruptions, he went too near the edge of the chasm and fell in. But it is probable that this is a fiction, as well as the story of Lucian about him, that his sandals were thrown out from the volcano, and thus the manner of his death ascertained. Others assert that he was drowned in his old age. Empedocles presented his philosophy in a poetical dress. His verses are marked by bold and glowing imagery, as well as by harmony and softness. Lucretius was his imitator. The iambic poem on the spheres, formerly ascribed to him, is now considered spurious. The best edition of his remains is that by Karsten (Amsterdam, 1838). Empedocles holds the four elements—earth, water, fire, air—as the fundamental and indestructible principles from whose union and separation everything that exists is formed. To these material principles are added the ideal principles of friendship and hatred.

EMPEROR (from the Latin *imperator;* in German, *Kaiser*, from *Cæsar*), the title of the highest rank of sovereigns. The word *imperator*, from *imperare*, to command, had very different meanings among the Romans at different periods. In the most general sense, it signified the commander of an army. In early times consuls were called *imperatores* before they entered on their office. The soldiers afterwards conferred the title on their general, after a victory, by hailing him *imperator:* the senate also called a victorious general *imperator* until he had celebrated his triumph. At a still later period no one was honoured with this title who had not defeated a hostile army of at least 10,000 men. After the overthrow of the republic *imperator* became the title of the rulers or emperors, and indicated the supreme power; the word *rex* being too odious to be assumed. Victorious generals were still, however, sometimes saluted with the title *imperator*, in its original sense. With the fall of Rome the title was lost in the West, but was kept up in the Eastern or Byzantine Empire for nearly ten centuries. In 800 it was renewed in the West when Charlemagne was crowned, by Leo III., as 'Carolus Augustus, the God-sent pious and great emperor of Rome.'

On the division of the Frankish Empire among the sons of Louis-le-Débonnaire, Lothaire, king of Italy, received the title. Charles the Bald, and several princes of Italy, bore it until Otho I., in 962 A.D., finally united the imperial crown with that of the German kings. Yet it was for many centuries considered necessary to be crowned at Rome, in order to be formally invested with the title of *emperor*. For reasons too many to be enumerated here, the idea that the Bishop of Rome was the highest spiritual ruler, and the emperor of the holy Roman Empire (or of Germany), the highest temporal sovereign, was gradually developed. All the other states were regarded as dependent upon him. By several of the powerful sovereigns, however, this claim was never admitted; and the rulers of Castile, France, and England, without formally adopting the imperial style, maintained that their crowns were imperial, and their states empires.

The Eastern Empire having been finally overthrown by the conquest of Constantinople in 1453, the imperial dignity in the East became extinct. The sultans, who succeeded the emperors, have never received, in official language, the title of emperor. This title was adopted in Russia by Peter I. in 1721, but the right of the Russian sovereign to its possession was not acknowledged by the German Empire until 1747, by France in 1745, and by Spain 1759. Napoleon adopted the old idea of an empire, as a general union of states under the protection, or at least political preponderance, of one powerful state. Napoleon crowned himself as emperor in 1804; the title fell into disuse at his deposition in 1815, but was revived by his nephew in 1852, with whom it again ended on the 5th September, 1870. In 1806 the first German Empire, 1000 years old, became extinct, and the German Emperor, Francis II., adopted the title of Francis I., emperor of Austria. In December, 1870, the second German Empire was formed, King William of Prussia having accepted the imperial office and title offered him at Versailles while engaged in the siege of Paris.

Great Britain is considered as an empire, the crown is imperial, and the Parliament is styled the *Imperial Parliament of Great Britain and Ireland;* but the sovereign has never adopted the imperial title, though this measure was proposed in Parliament in 1804. The sovereigns of Siam, China, Japan, and of Fez and Morocco, are often, though with little propriety, called *emperors*.

EMPEROR MOTH (*Saturnia pavonia minor*), one of the most beautiful species of British moths. The colour is grayish-brown, with a faint purple tinge. The wings are about 3 inches in expanse, the hinder margin of each having a band of pale-brown and purple. In the centre of each wing, on a light ground, is found a large eye-like glassy and transparent spot, consisting of a black pupil, with a yellow or gray iris, and partly surrounded by a light blue crescent. The larva is of a green colour, with a black band on each segment. The cocoon is not close at the extremity, but terminates in a converging circle of elastic hairs, which enables the insect to escape from it, but effectually prevents the invasion of intruders. This moth belongs to the same family as the silk-worm.

EMPHASIS, in rhetoric, a particular stress of utterance or force of voice given to the words or parts of a discourse, whose signification the speaker intends to impress specially on his audience, or a distinctive utterance of words specially significant, with

a degree and kind of stress suited to convey their meaning in the best manner. In writing the emphatic word or phrase is usually underlined; in printing a different kind of type is used, commonly the inclined character called *Italic*.

EMPIRIC, in medical history (from the Greek word *empeiria*, experience), an appellation assumed by a sect of physicians who contended that all hypothetical reasoning respecting the operations of the animal economy was useless, and that observation and experience alone were the foundation of the art of medicine. Empiric, in modern medicine, is applied to a person who sells or adminsters a particular drug or compound, as a remedy for a given disorder, without any consideration of its different stages, or degrees of violence, in different constitutions, climates, or seasons. For empiric philosophy, see EXPERIMENTAL PHILOSOPHY.

EMPOLI, a town in Tuscany, Italy, on the left bank of the Arno and the railway to Leghorn, 16 miles W.S.W. of Florence. It consists of several good squares and narrow streets, and the town proper is inclosed by walls. The principal edifices are an ancient collegiate church, with a fine façade and some good paintings, another church with some good frescoes, and an old palace. The manufactures consist chiefly of straw bonnets, beaver hats, and vases; and the weekly market is important. Pop. 6500.

EMPYREUMA (*empyreuma*, a gathering coal; *pyr*, fire), the smell acquired by organic matter when subjected to the action of fire, but not enough to carbonize it entirely. The products of imperfect combustion, as from wood heated in heaps or distilled in close vessels, are frequently distinguished as empyreumatic.

EMS, a celebrated watering-place in the Prussian province of Hesse-Nassau, on the river Lahn. The environs are beautiful. As early as 1583 it was used as a watering-place. The mineral waters at Ems are warm—from 70° to 118° Fahr.; they are of the saline class, containing large quantities of carbonic acid gas, and are used with much effect in chronic catarrhs, pulmonary complaints, diseases of the stomach arising from phlegm and acidity, gout, and some diseases of the urinary vessels. About 50,000 bottles of the water of Ems are sent away annually, and the number of visitors amounts to about 8000 each season. It was here that the memorable interview between the King of Prussia and the French ambassador, Benedetti, took place which formed the prologue to the Franco-Prussian war of 1870–71. Pop. 5458.

EMS, a river, Germany, which rises at the south-east extremity of the Teutoburger-Wald, in Lippe-Detmold, flows north-west, first through Rhenish-Prussia, and then through the west part of Hanover, and after a course of 234 miles falls into Dollart Bay, near the town of Emden. With the aid of the tide it is navigable for 13 miles by vessels of 200 tons. In 1818 it was connected by a canal with the Lippe, and thus with the Rhine, which greatly increased its importance with respect to commerce and navigation.

EMU. See CASSOWARY.

EMULSINE, or SYNAPTASE, a nitrogenous body discovered by Liebig and Wöhler in the course of their researches on amygdalin and on the formation of essential oil of bitter almonds. When sweet or bitter almonds are pressed a large quantity of an oil is obtained, of no particular taste or odour. If the cake which remains be macerated with water and distilled, nothing is obtained from sweet almonds; but an essential oil, with characteristic odour and taste, and poisonous, is got from bitter almonds. If, however, before macerating the bitter-almond cake, it be extracted with alcohol, it loses its power of yielding an essential oil, while the alcoholic extract on evaporation deposits a crystalline substance called amygdalin, to which the taste of the bitter almond is due. Now on adding amygdalin to cold emulsion of sweet almonds the essential oil is produced, showing that the oil is connected in some manner with the bitter principle. Again, if the almond cake, whether sweet or bitter, be mixed with three or four times its weight of water, and pressed, an emulsion is obtained, which on standing separates into an upper creamy, and a lower transparent stratum. If the lower stratum be treated with alcohol a precipitate is formed, which, when washed with alcohol and dried in a vacuum, forms a white opaque friable mass, soluble in water with an acid reaction, and which very soon putrefies. Its composition is unknown, but it contains nitrogen and a quantity of mineral matters. This is emulsine, and when added to amygdalin, as prepared above, in presence of water it at once decomposes it into essential oil of bitter almonds. It is this reaction which takes place on macerating the bitter-almond cake, but does not occur with the sweet, since although it contains emulsine, the decomposing agent, it contains no amygdalin to be decomposed. In the course of the reaction there are produced, besides the oil, glucose and prussic acid, which is the cause of the poisonous character of the oil. Emulsine is supposed to act after the manner of a ferment; if dry, it may be heated to 212° without loss of power, but by contact with boiling water its activity is destroyed. Emulsine also seems to be unable to decompose amygdalin in the stomach.

EMULSIONS, a term applied to the imperfect solutions of the fixed vegetable oils in water. They are obtained by rubbing the seeds affording these oils with water, to which a little sugar has been added.

ENAMELLING (from *enamel*, formed by a junction of the inseparable particle *en*—borrowed by us from the French, who had taken it from the Latin *in*—and the old English word *amel*, taken from the *émail* of the French, both signifying the material used in overlaying the variegated works which we call *enamelled*), the art of variegating with colours laid upon or into another body; also, a mode of painting, with vitrified colours, on gold, silver, copper, &c., and of melting these at the fire, or of making curious works in them at a lamp. This art is of so great antiquity as to render it difficult or impossible to trace it to its origin. It was known to the Assyrians, who used antimony, lead, oxide of tin, and copper to produce yellow, white, and blue glazes, the red being formed by suboxide of copper—the very substances, in fact, which are employed at the present day. It was also practised by the Egyptians, as is evident from the remains that have been observed on the ornamented envelopes of mummies. From Egypt it passed into Greece, and afterwards into Rome and its provinces, whence it was probably introduced into Great Britain, as various Roman antiquities have been dug up in different parts of the island, particularly in the barrows, in which enamels have formed portions of the ornaments. The gold cup given by King John to the corporation of Lynn, in Norfolk, proves that the art was known among the Normans, as the sides of the cup are embellished with various figures, whose garments are partly composed of coloured enamels. The art of enamelling reached its greatest perfection in the sixteenth century in Faënza, whence enamelled ware was called *faience*, and it was at this time that Palissy made his independent discovery of the process. Enamels are vitrifiable substances, and are usually arranged in three classes; namely, the transparent, the semitransparent, and opaque. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is ren-

dered either semitransparent or opaque by the admixture of metallic oxides. The art of colouring glass seems to be of nearly the same antiquity as the invention of making it, which is proved not only from written documents, but likewise by the variously coloured glass corals with which several of the Egyptian mummies are decorated. White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese to increase the brilliancy of the colour; sometimes phosphate of calcium, or simply ground bones, are used. The addition of the oxide of lead, or antimony, produces a yellow enamel, but a more beautiful yellow may be obtained from the oxide of silver. Reds are formed by copper, and by an intermixture of the oxides of gold and iron, that composed of the former being the most beautiful and permanent. Greens, violets, and blues are formed from the oxides of copper, cobalt, and iron; and these, when intermixed in different proportions, afford a great variety of intermediate colours. Sometimes the oxides are mixed before they are united to the vitreous bases. All the colours are produced by the metallic oxides. The principal quality of good enamel, and that which renders it fit for being applied to baked earthenware, or to metals, is the facility with which it acquires lustre by a moderate heat, or cherry-red heat, more or less, according to the nature of the enamel, without entering into complete fusion. Enamels applied to earthenware and metals possess this quality. Enamels are executed upon the surface of copper and other metals by a method similar to painting. Enamelling on plates of metal, and painting with vitrifiable colours on glass, are practised with great success in England. Enamelling has also been executed, on a comparatively large scale, in the manufacture of pots, pans, and other utensils for domestic use. The vessel is made of iron, and then after thorough cleansing with dilute sulphuric acid and water, the enamel, consisting of kaolin, or potter's clay, ground flints, and borax ground very fine, is laid on with water, and dried, and then the glaze is spread and the article subjected to heat in a muffle. Different materials are used for the body and for the glaze, metallic oxides, tin, antimony, or lead sometimes being added. The presence of these substances is objectionable in culinary vessels, as in some cases they may be attacked by acetic and other vegetable acids. Good enamelled vessels, free from lead, are tolerably permanent, and very easily cleaned. Enamelling in colours upon iron by stencilling has been employed for advertising and for sign-boards.

Photographic enamelling is effected on collodion sensitized with bichromate of ammonium and gum or honey, by dusting over the picture the enamel powder. The part not affected by the light retains the powder by its hygroscopicity, while the affected parts retain less or more of it, and produce the lights and shades; the film is then applied to the object to be enamelled, the collodion destroyed by sulphuric acid, and the piece is finally heated in a muffle. The process has been very successful.

ENARA, a lake, Russia, in the north of Finland, of a tolerably regular and nearly rectangular form, about 50 miles long, south-west to north-east, and 30 miles broad. It is studded by almost innumerable islets, receives several streams, of which the Ivalo, which joins it on its south shore, is the most important, and discharges itself by the Patsjoki into the Arctic Ocean. At its south-west extremity is a small town of same name, which is inhabited chiefly by fishermen, and has an annual fair of some importance.

ENAREA, a country of the Gallas, south from Abyssinia, between lat. 7° and 8° N.; and lon. 35° and 37° E. In the valley of the Gibbi, immediately beyond Sakha, the chief town and emporium of the country, are extensive plantations of coffee, which, along with ivory, is largely exported. The inhabitants are the most civilized of the Gallas, and show much skill in manufactures.

ENCAMPMENT. See CAMP.

ENCAUSTIC PAINTING (Greek, *enkaustikē*, from *enkaiein*, to burn in). Painting in encaustic is executed with the operation of fire. Ancient authors often mention this species of painting, which, if it had been described simply by the word *encaustic*, might be supposed to have been a species of enamel painting. But the expressions *encausto pingere*, *pictura encaustica*, *ceris pingere*, *picturam inurere*, by Pliny and other ancient writers, show that another species of painting is meant. We have no ancient pictures of this description, and therefore the precise manner adopted by the ancients is not completely understood, though many moderns have closely investigated the subject, and described their processes.

Pliny, in a passage relating to encaustic painting, distinguishes three species. It has been supposed that the first species consisted of spreading wax mixed with as much earth colour, finely powdered, as it could imbibe, on wood or on a wall, by means of a hot spatula. When the coating became cold, the designer cut the lines with a style or graver. Another and more probable explanation of this species is that by means of the style the colours mixed with wax were laid on to the prepared ground of the panel, and then blended by a hot iron. But inustion, as the final burning in is technically called, formed, it seems, an essential part of the process. The second species was probably a kind of intaglio. The outlines, first drawn on waxed ivory (for facilitating any necessary correction), were afterwards engraved in the substance, and the finished and shadowed design was filled in with the desired number of colours; and lastly, covered with a wax varnish. The third mode was the application of the colours with the brush or pencils. It is generally believed that the wax was dissolved, probably by means of an essential oil, the colours mixed with it, and laid on with a brush, and the painting then finished by a careful subjection to heat. For this purpose a hot iron, or a pan of coals (*cauterium*) was used.

As the thing chiefly regarded in encaustic painting was the securing of permanence and durability, by the application of fire, the word *encaustic* has been applied, in a very general sense, to other processes, in which both the material and the mode of applying the heat are entirely different from the ancient materials and modes. The word has been used, not only of wax-painting on wood, stone, and ivory, but also of painting on earthen vessels, of works in metal, where gold and silver were inlaid, melted, or laid on, and of everything which was gilt or silvered by fire; which was called *gold* or *silver encaustic*. The moderns have also used the term for painting on porcelain, and work in enamel; and in the same way it was given to the painting on glass of the middle ages, such as is now seen in the windows of some Gothic churches. It is evident that all these have nothing to do with the wax-painting of the ancients.

ENCAUSTIC TILES, a species of ornamental tiles made of a finer kind of clay than the ordinary tiles, but not so fine as porcelain. These are of two sorts: plain and figured. The plain tiles are sometimes square, but more frequently triangular, and of different colours; the latter shape renders possible a greater number of designs when the tiles are employed in a sort of mosaic work for the paving of churches, halls, &c. They are made by putting the coloured clay into strong steel moulds and subjecting it to a pressure of several hundred tons, by means of

In the philosophical and critical articles the peculiar sentiments of the writers of the Encyclopédie were received by the French public as the oracles of truth; and it became easy for the encyclopædists to give currency to what they called *philosophy*. They had also a great influence on the literary taste, not only of the French, but of other nations. Polished correctness, elegance of style, with an imitation of nature and a moral design, were the highest excellences which they saw in art, and the great objects of attainment. As they made the understanding the sole judge of poetry, which was therefore to be the cool product of reflection, their views, by means of the authority which they had acquired, tended extremely to cramp the genius of the French in respect to works of imagination, and to destroy all boldness and freedom. They gained a still greater authority by their philosophy, just suited as it was to the prevailing spirit of the French people. Indeed, there is hardly an instance to be found in which the literati of a nation have obtained so extensive and powerful an influence on political sentiment as the French literati, and particularly the French encyclopædists. Their philosophy, too, was a fashionable philosophy, a philosophy for common life, favourable to wit and gayety. This mixture of philosophy with elegant literature became still more interesting on account of the opinions which men like Mably, Condillac, Mercier, Raynal, Buffon, Helvetius, Diderot, and D'Alembert advanced on the subjects of religion and civil government; for which a prohibition was laid on the further progress of the work. But the printers only, and not the authors, were punished, and the government was soon after obliged to permit the work to proceed, as it was too weak to prevent it. To the encyclopædists, who were connected with the highest circles of that time, is justly attributed a very important influence on the French revolution.—This great work bore the title of Encylopédie, ou Dictionnaire raisonné des Sciences, des Arts et des Métiers, par une Société de Gens de Lettres, mis en Ordre par Diderot, et quant à la Partie mathématicale par D'Alembert (Paris, 1741–72, twenty-eight vols. fol.; Supplement, Amsterdam, Paris, 1776–77, five vols. fol.; Table des Matières, Paris, 1780, two vols. fol.; in all thirty-five volumes; also, at Geneva, 1777, thirty-nine vols. 4to; Lausanne and Berne, 1778–81, thirty-six vols. 8vo, three 4to vols. engravings).

ENDEMIC (from Greek *en* and *dēmos*, prevailing among the people). This name is often applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause, as the physical character of the place where they prevail, or in the employments, habits, and mode of living of the people. Every part of the world, every climate, and every country, has its peculiar endemics. Thus the tropical and warm climates are subject to peculiar cutaneous disorders, eruptions of various kinds, because the constant heat keeps up a strong action of the skin. In northern climates eruptions of the skin occur, but they are of a different kind. Thus in all the north polar countries, especially in Norway, a kind of leprosy, the *radesyge*, is prevalent, arising from the coldness and humidity of the climate, which dispose the skin to such disorders. Hot and moist countries generate the most violent typhoid and putrid fevers; the West Indies and some of the American seaports, for instance, produce the yellow fever. Places in a more dry and elevated situation, northern countries particularly, are peculiarly subject to inflammatory disorders. In countries and districts very much exposed to currents of wind, especially in mountainous places, we find at all seasons of the year, rheumatisms, catarrhs, and the whole train of complaints which have their origin in a sudden stoppage of the functions of the skin. In large and populous towns we meet with the most numerous instances of pulmonary consumption. In places that are damp, and at the same time not warm, for example, on marshes and large rivers, intermittent fevers are prevalent. In cold and damp countries like England, Sweden, and Holland the most frequent cases of croup occur.

Diseases which are endemic in one country may also appear in others, and become epidemic if the weather and other physical influences resemble those which are the causes of the endemic in the former place; the climate being for a time transferred, as it were, from one to the other. Thus, for instance, we find the croup sometimes during wet and cold weather appearing in high situations; intermittent fevers sometimes in places where they occur rarely for years, and then again attack great numbers; putrid and malignant fevers rage in all countries occasionally, and so of the rest.

Endemic disorders in some circumstances become contagious, and thereby spread to other persons, and may be transplanted to other places, the situation and circumstances of which predispose them to receive these disorders. This is known by the sad experience of the migrations of diseases, the spreading of the leprosy from the oriental countries to Europe, &c. It is useful to inquire into the endemical circumstances of countries, districts, and even cities and towns; some precautions may be thereby suggested to escape the sickness, or to obviate the unwholesomeness of the situation of the place in question. As, for instance, the physician of Pope Clement XI., Lancini, procured the draining and drying of the marshes about Pesaro, and the diseases which had arisen from the exhalations of these marshes immediately ceased. It is also very favourable to the cure of obstinate disorders for the invalid to remove to a climate opposed to his particular complaint. Thus it is customary in this country for people attacked with pulmonary complaints to travel to the south of France, and especially to the neighbourhood of Nice, the climate of which is incomparable. So it is of advantage to the consumptive to exchange the unwholesome city air, full of dust and fine particles of sand, for the pure atmosphere of the country. And so of other disorders.

ENDIVE. See CHICORY.

ENDLESS SCREW, a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion, in the adjustment of machines, rather than as transmitter of any great amount of power.

ENDLICHER, STEPHEN LADISLAUS, born at Presburg in 1804, was educated in the gymnasium there, and afterwards studied partly at Pesth and partly at Vienna, where he entered the archiepiscopal seminary and prepared to take orders. He had even completed his theological studies and taken the preparatory steps, when in 1826 circumstances of a family nature induced him to return to secular life. Two years after he obtained an appointment in the court library at Vienna, and was secured by his parents in a comfortable independency. He now engaged very zealously in the study of natural science, particularly botany, and that of the oriental tongues, particularly the Chinese. As a botanist he soon acquired a name, which procured him the appointment of conservator in this department of the Vienna Museum. In 1840 he was appointed professor of botany in the University of Vienna. At

the same time he was made director of the botanic garden, which he immediately began to reorganize. The Vienna Academy of Sciences owes its existence to the combined efforts of Endlicher and Hammer-Purgstall. He took part on the popular side in the German revolution of 1848, and, driven to despair by the intrigues of his enemies and pecuniary embarrassments produced by his excessive liberality in the cause of science, he is said by some to have died of a broken heart, and by others by his own hand, in 1849. A simple enumeration of his writings would suffice to prove his unwearied assiduity and the vast extent of his acquirements. Among others may be mentioned his Examen Criticum Codicis Quatuor Evangeliorum Byzantino-Corviniani; Flora Posoniensis; Sertum Cabulicum, drawn up in concert with Fenzl; Grundzüge einer neuen Theorie der Pflanzenzeugen; Enchiridion Botanicum; Anfangsgründe der Chines. Grammatik, and Rerum Hungaricarum Monumenta Arpadiana. All the works of Endlicher, while they astonish by their number and variety, are distinguished by depth and originality of thought.

ENDOGENOUS PLANTS. See BOTANY—Classification.

ENDOSKELETON, EXOSKELETON. These are convenient terms for certain obvious features, but they are inexact, and have not yet lost their primitive meaning, so as to become purely symbolical of certain anatomical generalizations. They are commonly used in contrast, an endoskeleton as the characteristic possession of a vertebrated animal, an exoskeleton of an invertebrated animal. The former consists of the cartilaginous and osseous framework, the latter of the hardened investments of the body, as the solid chitinous covering of beetles, or of the solid structures which, like the shells of molluscs, are secreted by the outer integumentary layers. The functions of a skeleton are—1. To protect the soft parts; 2. To give support to the body in locomotion; 3. To afford fixed points on which the muscles act in moving the limbs. When vertebrate and invertebrate animals are compared, the difference as regards the skeleton is less important than at first sight appears; it is, in fact, one of degree rather than kind. The vertebral column is not essential to a vertebrate animal if by it is meant a chain of bones articulated to each other, for the lancelet (*Amphioxus*) has a fibrous structure in this position; the essential character of a vertebrate is the partition which separates the spinal canal from the cavity of the abdomen and thorax, not the bones which may be developed in it. Moreover, in the ascidians, or tunicated molluscoids, a structure similar in character to that of the lancelet is found. The skull, or skeleton of the head in a vertebrate, has its analogue in the cartilaginous box which protects the chief nervous ganglia and sense organs of the cuttle-fish; while in the crab and other crustaceans, as well as in the spiders, the chain of ganglia on the under surface of the body is protected by a series of calcareous rods projecting inwards from the integument, and forming a canal of trellis-work. In the soft-bodied worms, and in insects, the muscles are attached by both ends to the inner surface of the integument; but in crustaceans, structures analogous in function to the bones of vertebrates are found in the limbs, projections inward from the integument of one joint which pass into the cavity of the next joint nearer the body, and thus act as levers by which the more distant joints are moved. In mammals there are muscles attached at both extremities to skin, thus the *panniculus carnosus* or broad sheet of muscle by which the hedgehog draws its spiny hood over its head and limbs, the smaller sheet by which the horse twitches insects and sometimes its rider off its back, and the muscle which in man represents the last reduction of this sheet, and helps to draw the corner of the mouth downward. These are all cutaneous muscles. Nor is an exoskeleton, in the popular sense, wanting among vertebrates; the scales of some fishes are bony plates, those of the sturgeon being very ornamental; the tortoise and turtle are well protected, and among mammals the armadillo, pangolin, and still more remarkably the extinct sloths of South America, are efficiently protected by bony plates more or less closely fitted together. Thus the position of the hard part is not distinctive of the two great groups into which animals are divided, but is a subordinate character in the definition of smaller assemblages.

ENDOSMOSE. See OSMOSE.

ENDYMION, according to some a huntsman, according to others a shepherd, and according to a third account a King of Elis. He is said to have asked of Zeus, whom many have called his father, eternal youth and eternal sleep. According to some, however, he was taken up into Olympus by Zeus, and becoming enamoured of Hera (Juno) was condemned to eternal sleep on that account. Others again relate that Selene (the moon), charmed with his beauty, conveyed him away to Mount Latmus in Caria, and threw him into a perpetual sleep in order that she might enjoy his kisses whenever she pleased. One story makes him the father of fifty daughters by Selene. The legend is the subject of Keats' principal poem. See DIANA.

ENERGY. The energy of a body is the power that it possesses of doing work, and it is measured by the work that it can perform. A body may possess energy in one of two forms, viz. as *kinetic* energy, that is the energy due to motion, and *potential* energy, that is energy due to what may be called a position of advantage. Thus a moving mass, a bullet for example, can do work in virtue of its motion, and the name kinetic energy (see also VIS VIVA) is given to energy of this kind. Under this name is also included energy belonging to molecular motion; that due to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy, we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock for instance,—or the case of a bent spring, the mainspring of a watch, which keeps the watch in motion while it is uncoiling. Under potential energy are included also the energy due to electrical separation, energy due to absorbed heat, energy due to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. See also KINETIC ENERGY; POTENTIAL ENERGY; WORK; HEAT (DYNAMICAL EQUIVALENT OF); &c. See also PRINCIPLE OF THE CONSERVATION OF ENERGY, under which name the doctrine of the Dissipation of Energy is briefly explained.

ENFANTIN, BARTHÉLEMY PROSPER, one of the chief apostles of St. Simonianism, and styled by its adherents le Père Enfantin. He was born 8th February, 1796, at Paris, where his father was a banker. In 1813 he entered the École Polytechnique, but as he assisted at the defence of Paris against the allies in the following year he was expelled. He then became clerk to a wholesale wine merchant, and was sent in the capacity of commercial traveller long journeys, which extended to the Netherlands, Germany, and even Russia. In 1821 he was employed as a banker at St. Petersburg, but returned in 1823 to Paris, where he afterwards obtained the post of director of the Caisse Hypothécaire. In 1825 he became acquainted with St. Simon, who was so charmed with his new disciple that when dying he confided to him the task of continuing the

work and of forming an association for the defence and promulgation of the new religion. Under the auspices of this association appeared a journal called the Producteur, which lived only for a year or so. About the year 1828 Enfantin had succeeded in drawing round him a considerable number of associates, some of whose names are not unknown in French literature; and public conferences were held, over which the government kept a suspicious eye. On the outbreak of the revolution of July, 1830, however, Enfantin had a free field, and issued his proclamation, in which he demanded a community of goods, the suppression of heritage, and the enfranchisement of women, which latter phrase meant with him community of wives. It was not long until the discordant elements inherent in such a society produced their due influence. Enfantin, the representative of the social and religious theories of the school, quarrelled with Bazard, the representative of its political ideas. The former organized model communities, which fell to pieces whenever they became subject to the experience of everyday life. Immense sums of money were advanced by enthusiastic believers, but were quickly swallowed up. The new organ of the sect, the Globe, was a failure; their convent at Ménilmontant, of which Enfantin was styled the supreme father, was broken up by government (1832). The father was sentenced to a year's imprisonment as an offender against public morality, but was liberated in a month or two. His next attempt was to found, in connection with a few faithful followers, a model colony in Egypt. At the end of two years ruin again stared them in the face, and on their return to France the disappointed *Père* retired to Tain (Drôme), where he lived for some time the peaceful life of a farmer. In 1841 the influence of some of his friends procured him employment as member of a scientific commission sent out to explore the industrial resources of Algiers. On his return he published a sensible and interesting work on the Colonization of Algiers (1848). The revolution of 1848 brought him again to the front, with his new journal, the Crédit. This venture stopped in 1850 for want of funds, and the influence of friends once more secured him a comfortable situation on the Lyons and Mediterranean Railway, which he held until his death in 1864. He had been almost forgotten during the last years of his existence, but the two pamphlets Réponse au P. Félix and Un dernier Mot au P. Félix (1858) brought his name for a short time once more into public notice.

ENFIELD, a market town, England, county of Middlesex, on the Eastern Counties Railway, 9 miles north by east of London, with an ancient church, several Dissenting chapels, the remains of an ancient palace, and a handsome modern stone cross. It is the seat of the well-known government manufactory of rifles and small-arms. Pop. 16,054.

ENFIELD, William, LL.D., a Dissenting divine of great learning and amiable character, was born at Sudbury in 1741. He was educated for the Dissenting ministry at Daventry, and in 1763 was chosen pastor to a congregation at Liverpool, where he published two volumes of Sermons, in 12mo, and a collection of Hymns and Family Prayers, which were well received. In 1770 he became resident tutor and lecturer on belles-lettres at the academy at Warrington, where he remained for several years, and published several works, including his well-known Speaker. Here he also drew up Institutes of Natural Philosophy, theoretical and experimental. After the dissolution of the academy he accepted an invitation to preside over a congregation at Norwich. In 1791 he published his Abridgment of Bruckers's History of Philosophy (two vols. 4to), a clear and able performance; and subsequently joined with Dr. Aikin and others in the General Biography (ten vols. 4to). He died in 1797.

ENFILADE (from the French *enfiler*), in the military art, is used in speaking of trenches or positions which may be scoured by the enemy's shot along the whole length. In conducting the approaches at a siege care must be taken that the trenches be not enfiladed from any work of the place. To avoid this they are generally cut in a zigzag.

ENGADINE, a beautiful valley in Switzerland, in the Grisons, on the banks of the Inn, bordering on the Tyrol, about 50 miles long, but in some parts very narrow, divided into Upper and Lower. The pop. of the whole valley amounts to about 12,000. The language generally spoken is the Ladin, a branch of the Romanic tongue. The majority of the young men leave the valley to push their fortunes, chiefly in North Germany and Russia, but return after they have amassed sufficient wealth to secure a quiet existence in their native place. Several pretty towns and villages are situated in the valley, which is visited by great numbers of strangers on account of its picturesque beauty and its mineral springs.

ENGEL, Johann Jakob, a popular prose writer of Germany, was born at Parchim in 1741, and received the rudiments of his education from his father, the clergyman of that place. After studying at several German universities he accepted the office of professor in a gymnasium at Berlin, where he was soon made a member of the Royal Academy of Sciences, and wrote the greatest part of his works. He afterwards went to Schwerin. On the accession of King Frederick William III. of Prussia, whose tutor he had been, he was invited by his former pupil to Berlin, where he made himself exceedingly useful in the Academy of Sciences by his excellent and instructive writings, and enjoyed the esteem and the society of the most eminent men. His unremitting labours, in spite of sickness and hypochondria, hastened his end. He died at the place of his birth in 1802. Among his philosophical works may be mentioned his Philosoph für die Welt, distinguished for acute observations on men and manners, enlivened by elegant illustrations. Of a similar character is his Mirror for Princes (Fürstenspiegel). His Ideen zu einer Mimik, full of taste, acuteness, and knowledge of human nature, may be regarded as a kind of manual for players. He also wrote some plays —Der dankbare Sohn, Edelknaben, &c. His Lorenz Stark, a novel, is a masterly picture of life and manners. A complete edition of his works appeared at Berlin, 1801–1806, in twelve vols., and a later edition at Frankfurt in 1857, also in twelve vols.

ENGELHARDT, Johann Georg Veit, a German theologian, born at Neustadt, on the Aisch (Bavaria), in 1791. He studied at Baireuth and Erlangen under Bertholdt and Vogel. In 1822 he became professor of theology at Erlangen. On his return from a tour in Sweden, England, and France he was appointed ecclesiastical councillor, and during the years 1845, 1847, and 1848 was the representative of his university in the diet at Munich. He died in 1855. His most celebrated works are a translation of the writings ascribed to Dionysius the Areopagite; Auslegung des speculativen Theils des Evangeliums Johannis durch einen Deutschen Mystischen Theologen (1839); Richard von St. Victor und Johannes Ruysbroek (1838); Handbuch der Kirchengeschichte (1834); and Dogmengeschichte (1839).

ENGHIEN, or Enguien, a town in Hainault, Belgium, situated on the slope of a hill, on the road between Brussels and Tournai. Here is a superb castle with a park and gardens. This place gave the title of duke to a prince of the house of Bourbon Condé in memory of a victory of the great Condé

obtained here. The last that bore the title was executed, March, 1804. (See ENGHIEN, DUKE OF.) Pop. 3852.

ENGHIEN, LOUIS ANTOINE HENRI DE BOURBON, DUKE OF, was born at Chantilly, August 2, 1772, and was the son of Louis Henry Joseph Condé, duke of Bourbon. On the outbreak of the revolution he quitted France, travelled through various parts of Europe, and went in 1792 to Flanders to join the troops of his grandfather, the Prince of Condé, in the campaign against France. From 1796 to 1799 he commanded with distinguished merit the vanguard of Condé's army, which was disbanded at the Peace of Lunéville (1801). He was then led, by his love of the Princess Charlotte de Rohan Rochefort, to Ettenheim, in Baden, where he resided as a private citizen, and where he married this lady. He was generally looked upon as the leader of the *émigrés*, and was suspected by the Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. A mysterious personage, who afterwards proved to be Pichegru, had been frequently seen to visit Cadoudal, and from the marks of respect shown him it was thought that it could be none other than the young duke. The spies of Napoleon reported that Enghien was often absent for ten or twelve days together from Ettenheim, and it was believed that on some of these occasions he had secretly visited Paris. Napoleon was determined to strike terror into the ranks of the Royalists and conspirators by a decisive blow, and despatched General Ordener with 300 dragoons and several brigades of gendarmerie to seize the duke and his companions, and Coulaincourt was sent to the Duke of Baden with the first consul's *explanations* for this unwarrantable invasion of his territory. The Duke of Enghien was seized at five o'clock in the morning of the 15th March, 1804, was conducted to Strasburg, and thence to the fortress of Vincennes, where he arrived on the evening of the 20th. That same night a court-martial, under the presidency of General Hullin, was assembled, and the prisoner was, after a mock trial, in which no witnesses were examined, found guilty on various charges of treason. He requested an interview with Bonaparte, which was refused, and he was immediately led out to execution. He was shot between four and five o'clock in the morning in the ditch outside the walls, and his body was thrown, dressed as it was, into a grave dug, it is said, the day before. Napoleon and the other chief actors in the tragedy took every pains to justify their conduct, or to throw the chief blame upon others' shoulders, and it is believed by some that the first consul found himself in the position of a leader whose subordinates are only too ready to rush to extreme measures on the least hint from their master.

ENGIA, the modern name of Ægina (which see).

ENGINEERING is, in its strict sense, the art of constructing or using engines, but the word is now applied in a more extended sense, not only to that art, but to that of executing such works as are the objects of civil and military architecture, in which engines or other mechanical appliances are extensively employed. It is divided into two branches, civil and military.

Civil engineering, as a profession, may be said to have originated in England about the year 1770, when the great improvements of the steam-engine by Watt opened up a new field for the talents of the engineer. Previous to that time, whenever the prospects of great advantage or profit induced individuals to incorporate themselves for the purpose of undertaking extensive systems of drainage, or for the supply of water, requiring the assistance of an engineer, recourse was generally had to the great masters of hydraulic engineering, the Dutch. But the extension of the manufactures of this country, and the consequent extension of its home and foreign commerce, called forth all the energies of its men of practical science and skill, who at length, in the works performed for facilitating communication between different places, attained an eminence unsurpassed by any other nation. It is impossible here to give anything like a complete sketch of the duties of a civil engineer. He should have such a knowledge of mathematics as will enable him to investigate, as well as to apply the rules laid down by writers on those branches of the mixed sciences to which his attention will most frequently be drawn. He should be well acquainted with the principles of mechanics, hydraulics, and in a fair measure with all the branches of natural philosophy; a certain amount of chemical knowledge will be of considerable advantage. He should be able to draw neatly, and should understand the principles of projection upon which all engineering drawings are constructed; and a general knowledge of the principles of architecture will be found very valuable. Having acquired the requisite amount of theoretical information, he must next devote himself to gain that practical knowledge which is essential in order to the proper application of this information. The occupations of the civil engineer are so numerous, and the demand for talent in this walk of life so great, that the profession may be said to be divided into several distinct bodies: those who turn their attention to the construction of docks, bridges, canals, lighthouses, railroads, sewage and drainage, &c., which come more particularly within the scope of the duty of a *civil engineer;* those who devote themselves to the manufacture of machinery, or the *mechanical engineer;* the *mining engineer*, who discovers minerals and manages mines, &c.

The duties of the military engineer consist in the construction of fortifications, including the trenches and batteries required in besieging places; also of barracks, magazines, of roads and bridges to facilitate the passage of an army. He should have a practical and theoretical knowledge of gunnery. In this country he is often called upon to undertake works which more properly belong to the business of a civil engineer, such as the survey of the country, the inspection of public works, in fact all the duties of a government engineer. In 1818 the London Institution of Civil Engineers was founded, and the publication of its Transactions has been most useful in disseminating the constantly accumulating data relating to the objects of the profession.

ENGINEERS, ROYAL, that corps in the British army intrusted with the construction of all military works, plans, surveys, &c. Until 1763 the duties of engineers were discharged by officers taken from the army generally, but about this time a permanent corps was formed, and in 1772 the first company of sappers and miners was organized at Gibraltar. In 1783 the engineers were raised to be a royal corps, and in 1812 several companies of artificers were converted into sappers and miners. This title was abolished and that of royal engineers substituted in 1857. The corps, which consisted in 1872 of 5217 men, is divided into forty companies, four of which are employed on the ordnance survey, six are at Chatham, and the remainder on works at home and abroad. The privates, who are generally skilled artisans, receive from 2½*d.* to 5*d.* a day more pay than the ordinary infantry soldier. Their period of regular service is twenty-one years, but they can purchase their discharge at any time. The discharge-purchase is higher in this corps than in any other, yet it is found that the length of service does not average over five years, so many are the inducements held

out to them by civil employers. The officers enter the Royal Military Academy as cadets, and compete for commissions; their subsequent promotion is by seniority.

ENGINEERS, STEAMBOAT, the persons employed to keep the engine or engines of a steamer in as efficient a state as possible, and to superintend their working. It is the duty of an engineer to set the engines in motion, regulate their speed, or stop them, when required. While the engine is at work he must see that every moving part is properly lubricated; that no steam passes through valves or joints that should be steam-tight; that no air enters in any part of the engine where it is desirable to keep up a vacuum; and that none of the bolts, pins, or keys work loose by the vibration and shift their position. He must take care that none of the working parts become overheated by any undue amount of friction arising from want of lubrication, excess of tightness, or any other disturbing cause. He must carefully observe the effect produced by the gradual wear and tear of the working parts, so that if the accuracy of any of these seems to be materially affected, steps may be taken to remedy this when lying up in harbour. He must see that the engine is kept perfectly clean; must wipe away all grit and all superfluous oil and grease, as soon as they have passed through the bearings. The boiler will require his ceaseless attention in order that the proper supply of steam may be generated for the engine. The engineer must take care that a constant supply of water is kept up in the boiler; that the furnaces are periodically and properly fired and cleared of the earthy matters of the coal; that the boilers do not become impregnated with salt by the continual evaporation going on, and that the action of the valves continues to be correct. On arriving in port, after a long voyage, he should examine all the interior parts of the engine and get all defects rectified immediately. The water should be blown off out of the boilers and the ashes and soot cleaned out of the furnaces and flues as soon as possible. The slightest leak that can be discovered must be instantly stopped, otherwise the defect will spread rapidly. Any incrustation that may have been deposited from the brine must be thoroughly cleaned out from every part of the boiler. Any broken floats or hook-bolts of the paddle-wheels must be replaced by new ones. If lying in a stream or tide-way, the wheels ought to be turned round every three or four days to change the parts exposed to the action of the water, and thus prevent corrosion.—An engineer should be trained as a mechanic, and be a fair worker in iron, brass, and wood. He should be able to make notes in his log of all that occurs in the engine-room. He should know as much of mechanical drawing as to enable him, in the event of any important part of the engines being broken, to make such a drawing of it as would enable a manufacturer to replace it. He should be acquainted with the leading principles of mechanics, hydrostatics, hydraulics, and pneumatics, to which should be added an acquaintance with the subject of steam, especially as regards its temperature, pressure, and latent heat. In the royal navy there are now three grades: inspector of machinery, chief-engineer, and assistant-engineer, the last rank being divided into three classes. All these are commissioned officers, and are strictly examined on the subjects indicated above previous to admission. (See Weale's Dictionary of Terms, &c.)

ENGLAND, including WALES, the southern and larger portion of the island of Great Britain, is situated between 50° and 55° 46′ N. lat., and 1° 46′ E. and 5° 42′ W. lon. On the N. it is bounded by Scotland; on all other sides it is washed by the sea; on the E. by the North Sea or German Ocean; on the S. by the English Channel; and on the W. by St. George's Channel and the Irish Sea. Its figure is triangular, the base of the triangle being formed by a line drawn from the South Foreland in Kent to Land's End in Cornwall; the eastern side by a line drawn from Berwick to the South Foreland; and the western side by another line commencing at Berwick and terminating at the Land's End. The dimensions of the triangle thus formed are: base, 317 miles; eastern side, 345 miles; western side, 425 miles. North of the Humber, the average breadth does not amount to one-third of the average breadth south from that point. The area of England and Wales is 37,319,221 acres, or 58,311 square miles. See BRITAIN.

SKETCH OF THE CIVIL HISTORY OF ENGLAND.—The leading facts of the early history of England during the time of the Romans will be found in the article BRITAIN. After the withdrawal of the Roman forces, which took place about the beginning of the fifth century A.D., owing to the invasions of Italy by the surrounding nations, the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbours. The wall which the Romans had built from the Tyne to the Solway, no longer defended by Roman discipline and courage, proved a feeble barrier. The Scots and Picts from the north quickly passed it and drove the terrified Britons to the southern extremities of the island. In this situation they could devise no other means of defence than to invite the Romans to resume that superiority over them which they had formerly possessed. The Romans, unable to repel the invasions of the northern tribes from the vicinity of Rome itself, little regarded the petitions of their former subjects.

The Scots and Picts, satisfied with the plunder which they had obtained, returned homewards; but when the Britons, supposing that they were now to live in peace, ventured to leave their lurking-places, they were informed of the approach of another army, more numerous than that which had just ravaged their country. Less able to defend themselves than formerly, they thought only of courting the aid of some more powerful people. The Saxons, a nation inhabiting the northern parts of Germany, were at that time famous for their bravery and the boldness of their piratical expeditions. By gifts and promises the Britons hoped that they might induce the Saxons to undertake their defence, an experiment of which the consequences showed them the danger. The Saxons, inured to warlike expeditions, willingly accepted the invitation. Their own country was not the most fertile, and could scarcely support the number of inhabitants which it contained; they hoped that in Britain they might acquire new settlements, more fertile than those which they were to abandon; and they doubted not of their being able to defend them.

Notwithstanding the terror which had been impressed on the Britons by the Scots and Picts, the Saxons seem to have reckoned these tribes by no means formidable. According to the Anglo-Saxon narratives of these events, they despatched only three ships, containing 1600 men, under the command of Hengest and Horsa, brothers. Vortigern, at that time king of the Britons, received them with joy and assigned them the isle of Thanet for a habitation. They immediately marched against the northern foe and justified the report of their valour by obtaining a complete victory. The date assigned to these events by the later Anglo-Saxon chronicles is 449 A.D.; but the true date of all that can be regarded as truly historical in what has just been recorded, is 450.

The Britons were soon convinced of the folly of their proceedings. They perceived that the Saxons,

whom they had invited for the purpose of protecting them, intended to make themselves masters of the country they had been invited to deliver, and were likely to become enemies more formidable than the Scots and Picts, from whose arms they had so earnestly sought to be rescued. They could invite no other nation to their protection: even had they known of such as were able and willing to assist them, their recent experience had shown them the danger of such assistance. They were compelled to shake off their lethargy, and to make some efforts for their independence. The Saxons were immediately attacked; but they were prepared to defend themselves. The Britons, indeed, exerted themselves much more vigorously than had been expected. Many battles were fought with various success, but with uniform cruelty. The history of these transactions is dark and confused. In this period the fancy of writers has placed an Arthur, and attributed to him exploits more nearly resembling those of romance than history. But whatever obscurity may be in the narrative of these transactions, it is sufficiently certain that, after a struggle which continued 150 years, the Saxons remained entire masters of the country; and in 585 the southern part of Britain, with the exception of Wales, was divided into seven kingdoms, well known by the name of the Heptarchy, and governed only by Saxon princes. As this division forms a principal era in the ancient geography of the country, it may not be improper to lay before the reader the mode in which South Britain was at that time divided, with the dates usually given for the duration of the different kingdoms. It is right to mention that authorities in many cases do not agree as to the dates of foundation and termination of the several kingdoms, and as to other particulars regarding them; what seemed to be the most general view has in each case been adopted.

1. Kingdom of Kent, founded by Hengest in 455, containing Kent. This kingdom ended in 823.

2. Kingdom of South Saxons, founded by Ella in 477, containing Sussex, Surrey. Ended in 689.

3. Kingdom of East Angles, founded by Uffa 571 or 575, containing Norfolk, Suffolk, Cambridge, Ely (Isle of). Ended in 792.

4. Kingdom of West Saxons, founded by Cerdic 519, containing Devon, Dorset, Somerset, Wilts, Hants, Berks, and part of Cornwall. Swallowed up the rest in 827.

5. Kingdom of Northumbria, founded by Ida 547, containing York, Durham, Cumberland, Westmoreland, Northumberland, and the east of Scotland to the Firth of Forth. Absorbed by Wessex in 827.

6. Kingdom of East Saxons, founded by Erchew in 527, containing Essex, Middlesex, Hertford (part). Ended in 823.

7. Kingdom of Mercia, founded by Cridda about 584, containing Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton, Lincoln, Huntingdon, Bedford, Buckingham, Oxford, Stafford, Derby, Salop, Nottingham, Chester, Hertford (part). Absorbed by Wessex in 827.

The history of the Anglo-Saxons, while the country continued to be divided into so many small and independent kingdoms, is not less confused than that of the period which immediately preceded it. Each prince was continually at war with his neighbours, and endeavouring to obtain for himself the entire sovereignty. Each state was, in its turn, annexed to some of its more powerful neighbours; and at length, in 827, Egbert, by the exertion of much valour, and the influence of a superior capacity, united in his own person the sovereignty of what had formerly been seven kingdoms; and gave the whole the name of England, a name which it has since retained. The state of affairs in England after the accession of Egbert was not much better than it had been before. The ability of Egbert was sufficient to preserve the unity of the kingdom which he had acquired; but that kingdom was now attacked by foreign enemies, the Danes, who repeated their invasions at short intervals during the whole of the Saxon period. Under some of the successors of Egbert, who did not possess as much ability as he did, the states out of which the Kingdom of England had been formed did not cohere so well together; and although England was now nominally one, we sometimes hear of rival rulers in different parts of the country at periods long subsequent to the unification of the kingdom under Egbert. This circumstance naturally weakened the resistance offered to the Danish invaders, inasmuch as each of the states connived at the mischief done to the others, in the hope of recovering its own independence. About half a century after the erection of England into a single kingdom the Danes made themselves masters of nearly the whole of England, and compelled the English king to live in obscurity for a time, and leave the invaders undisturbed possessors of what they had wrested from him. Fortunately the king at this time, Alfred the Great, who ascended the throne in 871, was one who had patience enough to wait until he could again gather his forces together in sufficient strength to meet the Danes with a chance of success, and skill enough to make good use of the forces which he collected. A battle took place between the English and Danes at Ethandune, in which the latter were totally defeated (May, 878). Soon after, their leader Guthrum concluded a peace with Alfred, in which he agreed to embrace Christianity, and to retire with his followers to a strip of land on the east coast, including the whole of Northumbria, which was to be reserved for them, and called the Danelagh. Alfred reigned till 901, and during the latter part of his reign did much to improve the condition of his people.

Although generally recognizing the supremacy of the English kings, the Danish settlers had chieftains of their own whom they were always ready to support against their neighbours when a favourable opportunity offered itself. The two immediate successors of Alfred, Edward and Athelstan, respectively the son and the grandson of Alfred, both vigorous and able rulers, had each in turn to direct his arms against the settlers of the Danelagh. During the reign of Edward (901–925) these settlers received aid from the pirates of the same race who at that time began anew to roam over the seas and commit ravages wherever they could conveniently effect a landing. In spite of this, however, Edward was able to make good his authority throughout England. Athelstan (925–940) was equally successful. He crushed all enemies at home, and was respected abroad. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar, and Edward the Martyr, are of less note. They are chiefly remarkable on account of the more or less conspicuous place which Dunstan, successively abbot, bishop, and archbishop, occupied during all of them. He was counsellor to King Edmund, minister of Edred, treasurer under Edwy; and although he was banished by this last monarch, his influence was great enough to excite a rebellion by which Edwy was deposed and Edgar his brother put in his place. During the reign of Edgar and his successor he was supreme. Throughout his whole career he naturally fostered the power of the church, but he manifested great ability as an administrator, and it was to a great extent due to him that from the time of Athelstan till after the death of Edward the Martyr (978 or 979) the country had comparative rest from the Danes. After the death of Edward Dunstan retired, and as the next king, Ethelred, was

a minor, the government was feebly conducted, and the Danes showed an evident intention of obtaining sovereignty of the whole of England. In this they were assisted by the renewed invasions of their countrymen. The degenerate English courtiers endeavoured, by giving the Danes money, to prevent their destructive ravages. The consequence was what might have been expected, they returned only the more suddenly. Animosities between the English and the Danes who had settled among them became daily more violent, and a general massacre of the latter took place on the 13th of November, 1002, which circumstance, instead of intimidating the Danes, and rendering their incursions less frequent, only stimulated them to more decisive attempts. Sweyn invaded the kingdom with a powerful army. Ethelred was compelled to take refuge in Normandy. Seizing a favourable opportunity, he afterwards returned, but found in Canute, afterwards called the Great, an adversary no less formidable than he had found in Sweyn.

Ethelred left his kingdom in 1016 to his son Edmund, who in the defence of his territories displayed uncommon valour; but the power and superiority of the Danes were now established too firmly to be shaken. Notwithstanding every exertion he was compelled to divide his kingdom with Canute, and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut), generally called the Great, espoused the widow of Ethelred, that he might thus reconcile to himself the minds of his new subjects. He obtained the name of Great, not only on account of his warlike, political, and civil qualifications, all of which seem to have been above the common rank, but from the extent of his dominions, being master of Denmark and Norway as well as England. After the conquest of England he passed the greater part of his life in peace. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the Saxon line was again restored in the person of Edward the Confessor. Edward died without heirs in 1066, and the crown was at once seized by Harold, the son of Godwin, and brother-in-law of the late king. Harold pretended that it was bequeathed to him by the late king. As his pretensions to the kingdom were founded only on his power, Harold did not enjoy it in quiet. He found many enemies, but none so formidable as the second-cousin of Edward, William of Normandy, who likewise pretended that he, by the will of Edward, was appointed to succeed to the English throne. To support his pretensions William made the most vigorous preparations. To divert Harold's attention he instigated the Danes to invade the northern counties, while he, with no less than 60,000 men, landed in the south. Harold vanquished the Danes, and hastened southwards to repel the Normans. The two armies met near Hastings, at a place then called Senlac, but afterwards Battle. They were nearly equal in numbers, and fought with an obstinacy proportioned to the great object for which they contended. Harold and his two brothers fell, and the victory was William's. This great event took place Oct. 14, 1066. Having in reality conquered the kingdom, William immediately claimed the government; but as he knew that none was powerful enough to dispute his pretensions, he was willing to receive the crown as his right, and was desirous of being accounted the lawful king rather than the conqueror of England. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him in prosecuting his enterprise, he bestowed the chief offices of government upon Normans, and divided among them a great part of the country. The English, offended at a mode of conduct which, though only what they had reason to expect, they accounted partial, reluctantly submitted to his sway, and seized almost every opportunity of making insurrections. Having reigned twenty-one years in England, and conducted the reins of government, in general, with success, he died in 1087.

William, commonly known by the name of Rufus, though he was only the conqueror's second son, by the artifices and intrigues of Lanfranc, an ecclesiastic, seized the English crown. Robert, the eldest son of William, ultimately renounced his claim to the throne of England in favour of his brother William Rufus, in consideration of the sum of 10,000 merks which the latter paid to him to enable him to join the Crusaders. In 1100 he was accidentally killed by an arrow while hunting in the New Forest, leaving behind him no legitimate children. The throne ought now to have reverted to Robert, his elder brother, but Henry, his younger brother, by securing the treasury, secured the inheritance. Anxious to obtain the affections of the people, that his imperfect title might be strengthened, he granted them a charter of rights, which in the time of John was made the foundation of the Great Charter. This would in some measure have compensated for his usurpation; but when Henry was confirmed in the throne he forgot his grant. Still farther to secure his crown he espoused Matilda, the great-granddaughter of Edmund Ironside, and thus the representative of the Anglo-Saxon line, resolved to unite in his offspring the rights of the Saxons as well as of the Normans. Robert, whose disposition seems to have been somewhat indolent, arrived in England in 1101, and claimed the crown which justly belonged to him. But the actual possession of it gave Henry an insuperable advantage. His father's treasure was sufficient to balance the contest; and to render himself still more safe Henry courted the favour of the clergy. The primate Anselm effected a reconciliation before any blood had been shed in the quarrel.

When Henry thought his power was sufficiently confirmed, he convinced the clergy that his friendship for them was not so sincere as he had found it necessary to pretend. He entered into a dispute with Anselm the primate, and with the pope, concerning the right of granting investiture to the clergy. He supported his quarrel with firmness, and at length, by compromising the matter, brought it to a more favourable issue than might have been expected. In 1135 he died in Normandy, leaving behind him only a daughter, Matilda: his son, William, having been drowned near the coast of Normandy; an incident at which Henry's grief was extreme.

By the will of Henry, his daughter Maud or Matilda, wife of the Earl of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V., emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed Maud was obliged to make her escape from England, and leave the throne to Stephen. The contest was, however, taken up by her son, Henry Plantagenet, who raised an army with which he succeeded in landing in England; but before there had been any renewal of actual warfare, an amicable arrangement was brought about between Henry and Stephen, by which it was agreed that the latter should continue to reign during the remainder of his life, but that he should be succeeded

by Henry. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II. A larger dominion was united under the sway of this monarch than had been held by any of the previous sovereigns of England, for at the time when he became King of England he was already in the possession of Anjou, Normandy, and Aquitaine. The first two of these he had inherited in 1151 from his father, who was hereditary Count of Anjou, and who had succeeded in wresting from Stephen the dukedom of Normandy in 1144. The last he had acquired by his marriage with Eleanor of Aquitaine, the divorced wife of Louis VII. of France, in 1152.

The reign of Henry II. was, in general, fortunate. The king found little difficulty in restraining the licentious powers of his barons; but when he attempted to abridge the exorbitant privileges of his clergy, he experienced a more resolute opposition, and all his vigour was necessary to support him in the arduous contest. The clergy claimed exemption not only from the taxes of the state, but also from its penal enactments; and Becket, now raised to the primacy, supported them in their demands. The assassination of this priest (see BECKET) subjected Henry to the wrath of the church. He had undertaken an expedition against Ireland, at that time in a distracted state, and consequently an easy prey to an invader. To complete this expedition the pope's permission was necessary; and this permission could not be obtained till Henry made many submissions to the pontiff, and promised, when he returned, to walk in pilgrimage to Becket's tomb. Permission was at last granted. Henry easily conquered Ireland: when he returned he walked to Becket's tomb; and lay all night upon the pavement before it; submitted to be scourged by the hands of monks, and thus completed the triumphs of the clergy. The latter part of Henry's life was exposed to many disasters, arising chiefly from the rebellious disposition of his own family. He had appointed his son, Prince Henry, to be his successor; but that prince was impatient to obtain the crown before the death of his father. His projects, however, were disappointed; and in a short time he died without leaving behind him any children. In his foreign wars the king was successful. William, the king of Scotland, was defeated, taken prisoner, compelled to own himself Henry's vassal, and to do homage for his whole kingdom. It has been remarked, with justice, that Henry was the first who placed the common people of England in a situation which led to their having a share in the government. To curb the power of the nobles he granted charters to towns, freeing them from all subjection to any but himself. Henry, perhaps, thought only of curbing the exorbitant power of the barons, while he laid the foundation of a new order in society, which at length completely altered the government.

Richard, who in 1189 succeeded to his father, inherited all the superstition and romantic bravery of the age. The frenzy of crusading had then invaded the minds of Europeans, and the English monarch was impatient to distinguish himself in so conspicuous a scene. Disregarding the evils which must ensue to his dominions from his absence, he made every exertion to raise the money which was requisite, and in order that he might not leave a hostile neighbour on the north of his dominions, he renounced for himself and his successors the claim arising from King William of Scotland's act of homage done to Henry II., of the kings of England to be the feudal superiors of those of Scotland, he hurried into the East, and acquired the character of an intrepid soldier. Returning homewards in disguise, through Germany, he was basely made prisoner by Leopold, duke of Austria. The affection of his subjects raised the sum necessary for his ransom; and he returned to his kingdom, which, during his absence, had been a scene of confusion. The two prelates to whom he had delegated his power had disagreed. John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude from his right the unfortunate Richard. Richard's presence for a time restored matters to some appearance of order; but the restlessness of his own disposition deprived him of all repose. He undertook an expedition against France; but at the siege of Chalons, in 1199, he received a wound by an arrow, which proved mortal.

That kingdom which John had so long sought to obtain by sinister methods, was at length his by succession; but he demonstrated how unworthy he was of the dignity to which he had so eagerly aspired. The reign of John was turbulent, disastrous to himself, but ultimately fortunate for his people. His follies, his crimes, and his ill-concerted attacks upon the power of his nobles, had alienated from him the affections of almost all his subjects. In this situation he undertook what had hitherto been found too difficult for the most prudent kings, supported by the undivided influence of the civil authority: he attempted to wrest from the ecclesiastics several of their privileges. The measures he adopted for this arduous undertaking were like his character, violent and imprudent. He forcibly ejected the monks from their convents, and even ventured in 1205 to oppose the pope in electing a successor to the see of Canterbury. The pope laid an interdict upon his kingdom, and excommunicated the king, absolving his subjects from their duties of allegiance. Had John been esteemed in England the fulminations of the pope would not have been formidable; but labouring under their universal hatred he was compelled to submit to the will of the pontiff, and was under the necessity of relinquishing his crown and again receiving it as a gift from the haughty bishop of Rome. Resenting the defection of his subjects in this unsuccessful dispute, John was eager to revenge upon them the indignities which he had undergone from the pontiff. He hoped that in this design the clergy, to whom he had yielded so far, would second him with all their influence. His subjects, on the other hand, had learned to entertain very despicable notions of their sovereign; they saw that he had neither prudence to form a good project nor fortitude to accomplish one which was bad. His nobles formed a resolution of compelling him to accede to such terms as might be necessary to secure their own privileges and to abridge the prerogatives of the crown. The clergy, instead of aiding him by their influence, entered warmly into the designs of the barons. John, after making a feeble and irresolute resistance, was obliged to yield to his nobles, as he formerly had done to the pope; and at Runnymead, yet revered for the important event, he signed the Great Charter (Magna Charta), which continues to be accounted the foundation of British liberty (June 15, 1215). During the next year John died. In his reign the dominions of England had been curtailed by the loss of the provinces of Normandy and Anjou, which John attempted to keep, but which Philip Augustus of France claimed for John's nephew, Prince Arthur, as French fiefs, and took possession of in 1204 and 1205. John was also deprived of part of Aquitaine, his possession in the south of France, being allowed to keep only that portion which now came to be called Guienne. The part now taken away was restored to Henry III.

The turbulent reign of John was succeeded by that of Henry III., almost equally turbulent. Henry was but ten years of age when he was crowned; and

during the first years of his reign the abilities of the Earl of Pembroke, who was declared regent, retained the kingdom in tranquillity; but when Henry at length assumed the reins of government he showed himself incapable of managing them. His great desire was to procure money from his subjects, not for the purpose of advancing national power and national prosperity, but to lavish on his pleasures, which were far from being the most refined. He often confirmed the charter which had been extorted from his father: he even added to it new privileges; but he as frequently broke through every part of it. The nobles, provoked by his breach of faith, had recourse to arms. Henry was compelled to grant everything required of him. A Parliament was summoned for the purpose of redressing grievances. They confirmed the charter of privileges for which the nation had so long contended; but having acquired the sovereign power, they were unwilling to give it up. It was agreed that a committee should carry on the national business during the intervals in which the Parliament did not meet. Simon de Montfort, earl of Leicester, engrossed the sole power. Prince Edward opposed the barons with an army, but was defeated, and taken prisoner. In 1258 Leicester called a new Parliament (the 'Mad Parliament'); and by summoning to it representatives of the people, he took into the legislature a body formerly unknown there, thus laying the foundation of the House of Commons, and consequently of British liberty. Prince Edward, finding means to escape from his guards, vanquished Leicester (who was slain in the battle) at Evesham in 1265, and restored his father Henry to that freedom and power of which he had long been deprived. But the efforts of Leicester were not without effect. The reforms he had introduced were respected at least in spirit, and the English people enjoyed a greater measure of liberty than hitherto. Henry died in 1272.

Edward received information of his father's death when returning from a Crusade, in which his love for military fame had engaged him. When he arrived in England he succeeded to the crown without opposition. He restored to the civil administration that regularity which, during the weak reign of his father and the civil wars which lately prevailed, had, in some degree, been forgotten. He even added to the laws a severity which had seldom before been experienced. He undertook, and in 1283 accomplished, the conquest of Wales; a country which, since that period, has given a title to the King of England's eldest son. When he attempted to reduce Scotland he was not equally successful. Though frequently vanquished in battle, and reduced to the greatest distress, the Scots were never subdued. Edward died at Carlisle in 1307 while leading a great army into Scotland, to complete the conquest of that country, on which he had set his heart. He was so much bent on uniting the whole island, including England, Scotland, and Wales, under his sway, that he paid little heed to his French possessions. He gave up the claim to Normandy, which the kings of England had never ceased to make since it was seized by Philip Augustus.

The whole of the reign of Edward II. was unfortunate to himself and calamitous to his kingdom. His father's last and most earnest request of him was to prosecute the war with Scotland, and never to desist till he had annexed that kingdom to his English dominions; but Edward's disposition and his capacity were both unlike those of his father. The war with Scotland was carried on, but the English were almost constantly unfortunate; and at length, at Bannockburn (June 24, 1314), they received a defeat from Robert Bruce, which insured the independence of Scotland, and prevented the English for many years from distressing that country by their almost continual invasions. Had the misfortunes of Edward consisted solely in the failure in his attempts at making foreign conquests, he might have been considered as comparatively happy; but his weak mind was incapable of regulating the lawless conduct of his barons: and his wife, a woman of a bold, intriguing, and somewhat libertine disposition, joined in the confederacy against him.

The regency of the queen was, in fact, the reign of her paramour Mortimer. Through a pretended moderation, indeed, he refused to accept a place in the privy-council; but while he governed the queen, his power in the kingdom was supreme. Edward III. soon showed a disposition entirely different from that of his father. In 1329 he took the reins of government into his own hands; and commenced his reign with a vigorous exertion of power. He seized Mortimer and the queen in the castle of Nottingham. The former was, with little examination, condemned to death; the latter was confined, during life, in the castle of Risings.

The sceptre was no sooner secured in the hands of Edward than he displayed a warlike genius. His main projects were directed against France, the crown of which he claimed after the death of the last of the three sons of Philip the Fair, in 1328, in virtue of his mother, the daughter of Philip. This claim he made in spite of the fact that the Salic law in France did not admit of a woman occupying the French throne, Edward maintaining that although no woman could inherit the French throne, yet the right of succession might be transmitted by a woman. The war with France lasted for many years, and was carried on by the English with brilliant success. The victory won by the Black Prince at Creçy (1346), the capture of Calais (1347), and the victory of Poitiers (1356), ultimately led to the peace of Brétigny in 1360, by which Edward received all the west of France on condition of renouncing his claim to the French throne. (See BRÉTIGNY.) Before the close of his reign, however, these advantages were all lost again. England was deprived even of her hereditary possession Guienne, and retained only a few of the principal towns on the coast. Edward died in 1377.

Edward was succeeded by his grandson Richard II., the son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that they had acquired just notions of government. In 1380, a poll-tax, of all taxes the most impolitic, and in this case rendered more than usually oppressive, by imposing the same sum on the rich and on the poor, excited the indignation of all, especially of the lower ranks, by whom it was most severely felt. A blacksmith in Kent, resenting an indignity offered to his daughter by one of the tax-gatherers, with a blow of his hammer laid him dead at his feet. This was the signal for insurrection: the people flocked together from every hand, and 100,000 men, under the smith, called Wat Tyler, marched towards London, claiming a redress of their grievances (1381). But after committing several outrages, the rebels were dispersed. Wat Tyler, while conferring with the king, was put to death; and the prudence and courage of Richard appeased the insurgents, who were preparing to avenge the death of their leader.

The conduct of Richard on this occasion, when he was only fifteen years of age, inspired hopes of a prosperous administration; but Richard was mild, perhaps effeminate, and deficient in that vigour which was necessary to curb the licentiousness of the nobles: though guilty of few outrages, therefore, towards his people, almost the whole of his reign was turbulent and unhappy. In a quarrel between

the Duke of Norfolk and the king's cousin, Henry Bolingbroke, duke of Hereford, son of the Duke of Lancaster, the fourth son of Edward III., Richard interfered, and banished the former for life, and the latter for ten years, a period afterwards limited to five. Both nobles obeyed the king's mandate; but during the absence of Bolingbroke his father died, and Richard unjustly appropriated the patrimony that ought to have fallen to Bolingbroke. To avenge the injustice Bolingbroke, now Duke of Lancaster, took advantage of the king's absence in Ireland to land in England and collect an army to act against Richard. So great was the number of the malcontents in England that he soon found himself at the head of 60,000 men, while Richard could only muster one-third of that number. Richard was thus obliged to surrender unconditionally. He was confined in the Tower, and solemnly deposed by Parliament, Henry being appointed king (1399), the first of the House of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV., acquired the crown, rendered his reign, as might be expected, extremely turbulent. The nobles, by whose aid he ascended the throne, thought that no reward equalled their services; while Henry justly dreaded that power, which, as it first raised him, could again at pleasure depress him. Such, however, was the vigour of his administration, and the promptitude of his measures, that every insurrection was quelled, and those who endeavoured to deprive him of power disappointed. During the reign of Henry IV. the clergy of England first endeavoured to confirm their power by burning such as differed from them in religious tenets, an act (*de haeretico comburendo*) having been passed in the second year of his reign, empowering them to do so. The act was chiefly directed against the Lollards, as the followers of Wycliffe, the translator of the Bible into English, now came to be called. Henry died in 1413, leaving his crown to his son, Henry V.

The earlier years of the prince who now ascended the throne had been distinguished chiefly by riot and dissipation; but he no sooner saw the sceptre in his power than he transferred his activity to pursuits more honourable to himself and more useful to his people. Taking advantage of the disorder in which the French nation was involved at this time, Henry, reviving the claim of Edward III. to the throne of France in 1415, invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; and the celebrated victory at Agincourt in 1415 dissipated the small portion of courage and unanimity which had formerly prevailed. A peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, the daughter of the French king, Charles VI., was appointed regent of France during the reign of his father-in-law (who was imbecile), and declared heir to the throne on his death. The two kings, Henry and Charles, died within a few weeks of each other in 1422, and the infant son of Henry thus became King of England and France at the age of nine months.

England, during the reign of Henry VI., was subjected, in the first place, to all the confusion incident to a long minority, and afterwards to all the misery of a civil war. Of a weakly body, and possessed of a mind still more weakly, Henry allowed himself to be managed by any one who had the courage to assume the conduct of his affairs. Margaret of Anjou, to whom he was married, was a woman of uncommon capacity; but she was by no means scrupulous as to the means by which her designs were accomplished. Even her intentions were not always innocent; and she more frequently involved the kingdom in confusion, than used her influence for quelling such disturbances as were unavoidable. During this reign, in its turn disgraced by weakness of administration and the violent perversion of justice, the French began gradually to recover from that degraded state into which they had fallen during the reign of Henry V. The English forces were weakly supported, and the celebrated Maid of Orleans inspired her countrymen with new energies, and chased the terrified English from the French territories. The loss of France was not, perhaps, so great a misfortune as was at that time imagined; the civil commotions which immediately followed were much more destructive of national prosperity. Richard, duke of York, the father of Edward, afterwards Edward IV., in 1450 began to advance his pretensions to the throne, which had been so long usurped by the house of Lancaster. The pretensions of Richard to the throne were founded on his descent from the third son of Edward III., Lionel, duke of Clarence, who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, duke of Lancaster, the fourth son of Edward III. It may be mentioned that Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The claims of the two rival competitors for the throne are completely stated in Shakspeare's King Henry VI. part II. act ii. scene 2, where they are summed up by the Earl of Warwick ('the King-maker') addressing Richard of York in the following words:—

> 'What plain proceedings are more plain than this?
> Henry doth claim the crown from John of Gaunt,
> The fourth son; York claims it from the third.
> Till Lionel's issue fails his should not reign:
> It fails not yet; but flourishes in thee,
> And in thy sons, fair slips of such a stock.'

The wars which resulted from the endeavours of Richard to make good his title to the crown of England are called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster, and a white one that of the house of York. It is impossible in such a brief sketch as this to recount all the vicissitudes of these bloody wars. Some of the details will be found in the articles relating to those who were most prominent during this epoch, and it is enough to say here that they are considered as lasting for thirty years (from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, Aug. 22, 1485); that during this time Henry VI. was twice driven from the throne (in 1461 and 1471) by Edward of York (whose father had previously been killed in battle in 1460); that Edward of York reigned as Edward IV. from 1461 till his death in 1483, with a brief interval in 1471; that he was succeeded by two other sovereigns of the house of York, first his son Edward V., who reigned for eleven weeks in 1483; and then by his brother Richard III., uncle of Edward V., who reigned from 1483 till 1485, when he was defeated and slain on Bosworth field by Henry Tudor, of the house of Lancaster, who then became Henry VII. Henry VII. was at this time the representative of the house of Lancaster, through his descent from Henry Beaufort, cardinal of Winchester, one of the younger sons of John of Lancaster, his mother being the granddaughter of the cardinal. Through his father he was Earl of Richmond. Henry felt that his claim to the crown, except on the ground of victory, was not a strong one, and in order at once to strengthen his own title, and to put an end to the rivalry between the houses of York and Lancaster, he married in 1486 Eliza-

beth, the sister of Edward V., and heiress of the house of York.

The turbulence which had prevailed in England during the civil wars did not suddenly subside; and though Henry's administration was vigilant and active, he was often disturbed by those attempts at insurrection which had become in some degree habitual to the nobles. In one point of view, indeed, his own conduct tended rather to augment than diminish the attempts at rebellion. His hatred to the house of York, notwithstanding his union to it in the person of his queen, was continually evident; and contributed to irritate those factions which the friends of their country had fondly hoped would have subsided. The impostures, first of Lambert Simnel, who pretended to be a son of the Duke of Clarence, brother of Edward IV.; afterwards of Perkin Warbeck, who affirmed that he was Richard Plantagenet, duke of York, younger brother of Edward V.; and the support which those impostors received from his subjects, convinced Henry that the house of York had still many friends: and the temper of the king led him rather to terrify them into obedience by his severity, than to reconcile them to his sway by a mild demeanour. The numerous enemies of Henry's power, however, found him always prepared; and though the standard of rebellion was often reared, it never for a moment obtained a dangerous ascendency in the kingdom. The king's knowledge, indeed, of the political art of reigning, equalled, if it did not excel, that of his most illustrious predecessors. He anxiously accumulated money, using every available means to extort it from his subjects. His principal instruments in his schemes of extortion were the infamous Empson and Dudley. Under pretext of undertaking an expedition against France he extorted money from his people; and obtained money from the French king for relinquishing a purpose which he never intended seriously to prosecute. Perceiving that the most imminent danger to the kings of England proceeded from the great influence of the nobles, he adopted such measures as gradually tended, without violence, to undermine their power. He permitted the nobles to sell their lands; and, under the severest penalties, forbade them to retain a great number of followers, who, under the name of servants, were ever ready to perform the most iniquitous orders of their masters. These measures, steadily pursued, necessarily, though silently, undermined the power of the nobles, and gave the death-blow to feudalism in England. After a reign prosperous to himself, and in general not unfriendly to the interests of his country, Henry died in 1509. (For an account of the leading events in Ireland during the reign of Henry VII. see IRELAND.)

The authority of the English crown, which had been so much extended by Henry VII., was by Henry VIII. exerted in such a manner as justly to entail on his memory the imputations of tyranny and caprice. During his time the power of Europe was divided between the illustrious rivals Francis I. of France and Charles V. of Germany. Henry's situation was such, that it belonged to him to hold the balance between them; and thus, in a very easy manner, he might have rendered himself, in one sense, superior to both. Instead, however, of guiding himself by the rules of policy, or even the dictates of a permanent friendship, he lent his aid to such as most successfully flattered his vanity. And though he did maintain between those monarchs a species of balance, by not affording his assistance permanently or exclusively to either, accident more than design gave rise to his conduct.

England owes to Henry VIII. the introduction of the Reformation; but this too was owing to his caprice, and to the casual situation of his private affairs, more than to his conviction of the necessity of a reformation in religion, or the solidity of reasoning employed by the reformers. Henry had been espoused to Catharine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became disgusted with his queen, whom, indeed, he never greatly loved. She was somewhat older than he; all his children by her died in their infancy except the Princess Mary; and the king was enamoured of one of the queen's maids of honour, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; and when the pope made delays, and ultimately denounced the course pursued by Henry, the latter broke away entirely from the Holy See, and in 1535 got himself recognized by act of Parliament as the head of the English Church.

Had not the extravagance of Henry equalled his other vices, he might have amassed immense wealth. When he quarrelled with the pope he was careful to dissolve all the religious houses, monasteries, and convents, and he immediately seized their revenues. It is not easy to perceive to what extravagancies his own impetuosity and the servile complaisance of his Parliament might have hurried him: his conduct was becoming daily more capricious and tyrannical, when he died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catharine of Arragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour. Edward reigned first, with the title of Edward VI. He was but nine years of age at the time of his succession. His father, by his will, had declared that Edward was to assume into his own hands the reins of government when he should be eighteen years of age; but he lived not to reach that period: he died when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterwards Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers. The Protestants attained great part of the power which had formerly been engrossed by the Catholics; and in their turn showed themselves extremely willing to put in practice all the arts of persecution. Edward died in 1553.

The intrigues of Dudley, duke of Northumberland, during the reign of Edward, procured Lady Jane Grey, who was married to the duke's son, Lord Guildford Dudley, to be declared his successor; and after that prince's death she was, almost without her knowledge, proclaimed queen, and forced, very much against her inclination, to ascend the throne. The pretext on which she was put forward as a claimant for the crown was that she was the granddaughter of Mary, the second daughter of Henry VII.; and the prior claims of the three princesses, Mary and Elizabeth, daughters of Henry VIII., and Mary, queen of Scots, granddaughter of Margaret, eldest daughter of Henry VII., were set aside by her supporters, in the case of the first two by the allegation of their illegitimacy, and in the case of the last, on the ground that she was a foreign princess. Her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII., was placed upon the throne. Lady Jane Grey and her husband were both confined to the Tower; and, notwithstanding that their pretended criminal conduct was altogether involuntary, they were afterwards executed.

Mary, a bigoted Catholic, seems to have wished for the crown only for the purpose of re-establishing the Romish faith; and her purposes were faithfully

executed by Bonner, a zealot, no less bigoted than herself. Political motives had induced Philip of Spain to accept of Mary as a spouse; but, notwithstanding her affection for him, she could never prevail on her subjects to allow him any share of power. He, for that reason, openly despised her; and, indeed, seldom saw her, or visited England. Vexation on this account, as well as on account of the loss of Calais, the last possession in France now remaining to England, in 1558, added to other maladies, hastened Mary's end. She died in November in the same year in which Calais was taken.

Elizabeth succeeded to her sister Mary. Herself attached to the Protestant faith, she was resolved to establish it in England, and found little difficulty in the undertaking, as Mary's persecutions had rendered the Catholic profession extremely odious.

Having concluded a peace with France, Elizabeth had leisure to take part in the affairs of Scotland, which at that time were involved in confusion. The plan of the English queen was to continue and foment, rather than terminate, this confusion. She artfully effected her purpose, by encouraging and supporting, in their turns, the heads of the different factions. She thus secured herself from the designs of a troublesome neighbour, and prevented any intention which the French might entertain of invading her from the Scottish frontier. Her activity in Scottish affairs was augmented by her rivalry with Mary, the queen of Scotland, and the secret hatred which she cherished towards her. When that princess's crimes, according to some, or her misfortunes, according to others, induced her to take shelter in England, Elizabeth, instead of using her with kindness, or protecting her from insult, made her a prisoner; refused to see her; retained her many years in confinement; encouraged her subjects in the accusation of their sovereign; and at last, by an iniquitous sentence, condemned her to lose her life. Whether Mary's conduct were criminal or unfortunate, Elizabeth's proceedings cannot be palliated. They fix on her memory a stain which time cannot obliterate.

England was the most powerful nation which had adopted the Protestant faith; and on that account Elizabeth was hated by all the Catholic sovereigns. Philip of Spain, actuated by that bigotry which so strongly marked his character, and incited by policy, as well as by personal animosity, resolved to attack Elizabeth in her own dominions, and to annihilate the heretical kingdom. With this view, he, in 1588, fitted out a fleet more powerful than any which Europe had yet seen; and manned it with his most experienced sailors, and his bravest soldiers, styling it the 'Invincible Armada.' It was placed under the command of Alfonso Perez, duke of Medina Sidonia. It arrived on the English coast; but instead of finding an easy prey, was fiercely attacked by Elizabeth's fleet, under Lord Howard of Effingham, which, though not of equal strength, was more manageable. The English vessels were under the command of officers of approved valour and skill: by seizing every favourable opportunity they gained many advantages over the Spaniards, and at length convinced them that their hopes of conquest had been somewhat too sanguine. Directed with little knowledge, and ill provided for a long voyage, the Spaniards were soon in want of every necessary. A storm which at this time overtook them completed that destruction which the English fleet had commenced. The Spanish fleet sailed homewards by the northern part of the island; many of them were wrecked on the coasts of Scotland; and of the whole invincible armada few ships returned safe to Spain.

Worn out with the cares of state, and oppressed by griefs of a more private kind, Elizabeth, after a reign of forty-five years, at length sunk under the combined pressure. The execution of the Earl of Essex, who had been her chief favourite, but who abused her goodness, more than any other cause, seemed to unhinge her soul. She expired in 1603, and was succeeded by James VI. of Scotland, who was descended from Henry VII. by his eldest daughter Margaret, who had been given in marriage to James V. (For an account of the policy which Elizabeth pursued in Ireland, see IRELAND.)

The character of Elizabeth, as well as of other distinguished monarchs of England, will be found more fully dwelt upon in the several articles under their respective names, than in the present slight historical sketch. The reader, therefore, is referred to these for fuller information. The history of England after the union of the crowns, as well as many details connected with the statistics of the country, will be found under the article BRITAIN.

SKETCH OF THE ECCLESIASTICAL HISTORY OF ENGLAND.—The first religion of the Celtic aborigines of England was Druidism. See DRUIDS.

It is impossible for us to fix, with precision, the commencement of Christianity in Britain. It has been conjectured that the light of the gospel may have reached Britain, by the way of France (then called Transalpine Gaul), before the conclusion of the first, or not long after the commencement of the second century. As no churches are recorded to have existed in France before the second century, we may warrantably infer that none existed in Britain till some time after they were established in France. Tertullian, who lived during the latter part of the second and the first part of the third century, is the most ancient authority who attests the existence and prevalence of Christianity in Britain. He does so in one of his apologies; but his authority, unless corroborated by other evidences, must be received with caution; for an apparent proneness to exaggeration is visible in the work in which the statement is made. But of this we are certain, that it made considerable progress in our island previous to the time of Constantine the Great (306–337). There can be no reasonable doubt, that when Christianity was established by Constantine within the ample range of the Roman Empire, it would make more ample progress in this country than before that event. But we know very little about it till the rise of the Pelagian heresy, at the commencement of the fifth century. Pelagius, that noted heresiarch, was a native of Wales, whose real name is supposed to have been Morgan; and his coadjutor in spreading the heresy which bears his name was Celestius, an Irishman. Their peculiar opinions made considerable progress among the British Christians, as might reasonably have been expected, but were at length extinguished by the efforts of Germanus and his disciples. Several bishops from Britain sat in the famous Council of Nice, A.D. 325, as also at the Council of Sardica, 347; and of Ariminum, in Italy, in 359; and in A.D. 519 an ecclesiastical synod of all the British clergy was held by St. David, archbishop of Caerleon, and uncle of the famous King Arthur, for extirpating the remains, and preventing the revival, of the Pelagian heresy.

But, however flourishing and prosperous the state of Christianity might have been in the times of Roman subjugation, it was doomed to suffer a total eclipse, nay, an almost utter extinction, by the arrival of the pagan Saxons. (For their religion, see NORTHERN MYTHOLOGY.) It was not till A.D. 570 that the first rays of evangelical light dawned upon the Saxon conquerors of Britain, by means of a marriage alliance between one of their petty monarchs and the daughter of a king of France, a princess warmly

attached to Christianity. In A.D. 596 the famous Austin, or St. Augustine, was sent over by Pope Gregory the Great to attempt their conversion. He, with forty other monks, landed in England, and was kindly received by Ethelbert, who assigned Canterbury as the place of residence to Austin and his companions. They entered it in solemn procession, carrying the picture of Christ before them, and a silver cross, singing a hymn. Their pious endeavours were crowned with such success, that in a very short time the king and most of his subjects were converted; and no fewer than 10,000 of them were baptized on Christmas day. Upon the news of Austin's success at the Papal court, more missionaries were sent to Austin, and a model for the government of the infant church, and a valuable library of books, vestments, sacred utensils, and holy relics. Austin's efforts, however, to reduce the Welsh Christians to dependence on the Papal authority failed of success; and, in revenge, the ghostly abbot threatened them with the wrath of Heaven and the hostilities of the English.

The East Saxons were soon after converted by Mellitus, and a bishop's see was established at London, their capital, early in the seventh century. The Northumbrians were next converted, which auspicious event was accelerated by the marriage of their king, Edwin, with Ethelburga, a daughter of Ethelbert, king of Kent. That princess having the free exercise of her religion secured to her and her household, was accompanied by Paulinus, a missionary, into her new dominions, whose labours were so successful, that Edwin and his high-priest Coiffi, a great many of the nobility, and great multitudes of the common people, renounced paganism and were baptized; no fewer than 12,000 are said to have received the initiatory rite of baptism in one day. By the influence of Edwin and Paulinus, Carpwald, king of the East Angles, and many of his subjects, were converted; and as a reward for the services of Paulinus, Edwin erected a bishop's see at York, and even obtained an archbishop's pall for him from Pope Honorius I., who sent one at the same time also to Canterbury. The conversion of the other kingdoms of the heptarchy followed in the course of the seventh century.

As Kent and Wessex received Christianity from Romish and French missionaries, and Mercia and Northumbria through the Scottish Culdees (for Northumbria had apostatized after the death of its first Christian king, and received Christianity anew from a Scottish source), there were certain differences between the churches, especially concerning the time of keeping Easter. To promote the union of the churches thus founded in England with the Church of Rome, a grand council was summoned by Theodore of Tarsus, archbishop of Canterbury, to meet at Hertford, A.D. 673, at which he presided; and obtained their consent to a number of canons which he had brought from Rome, demanding a perfect uniformity among all the English churches. Besides this union among the English churches, and conformity to the Romish Church, which was brought about by Theodore, several new doctrines and practices were introduced that were formerly unknown; amongst these was the introduction of an auricular or secret confession to a priest, as necessary to absolution, directly contrary to the doctrines of the Scottish missionaries, who taught that confession to God was sufficient. Theodore, by his address, now obtained the recognition of Canterbury as the metropolitan see, exercising authority over all the English clergy.

The clergy, by their successive encroachments upon the liberties of the people and the rights of the sovereign, attained, particularly after the era of the Norman conquest, to such a height of spiritual and temporal domination as to form an *imperium in imperio*. Gregory VII., who filled the Papal throne from 1073 to 1085, was the most audacious and ambitious, the most able and arrogant pontiff that ever sat in the chair of St. Peter. Having wrested the right of supremacy and investiture from every Christian prince, he imposed the following oath of allegiance, upon every bishop at his inauguration, to the temporal and spiritual authority of himself and successors: viz. 'The rights, privileges, and authority of the holy Roman Church, and of our lord the pope, and his successors, I will be careful to defend, enlarge, and promote; all heretics, schismatics, and rebels against our said lord and his successors I will, to the utmost of my power, persecute and impugn.' From this time the bishops became the spies and sentinels of Rome; and in order to insulate their affections, to detach them from the state to which they belonged, and to engage them thoroughly in the interest of the holy see, celibacy was strictly enjoined. William the Conqueror, to whom a circular letter was sent by Gregory demanding an annual tribute, boldly resisted this claim, and asserted his right as an independent sovereign, denying that his kingdom was a fief of the holy see, but agreed to pay the tax of Peter's-pence. This was a tax of a penny on each house, said to have been first granted by Ina, king of Wessex, about A.D. 720, for the establishment of an English college at Rome. In process of time it became a standing and general tax over all England: and though at first it was applied to the support of the English college at Rome, the popes found means to appropriate it to themselves. It was confirmed by the laws of Canute, Edward the Confessor, William of Normandy, &c., and was not totally abolished till the reign of Henry VIII.

In the reign of Henry II. the power of the clergy had arrived to a stupendous height, as is clearly shown by the whole history of the quarrel of that monarch with his leading prelate, Thomas Becket, an account of which is given in the article BECKET (THOMAS). As is well known, this quarrel resulted in the murder of Becket by four of Henry's barons (Dec. 29, 1170), but the severity of the penance exacted from Henry on this account is a striking proof of the power that the church then had in punishing all offences committed against itself.

In order to atone for his offence, and to procure full reconciliation with the church, he had to bind himself to give to the knights templars as much money as would pay two hundred knights for one year to serve in the Holy Land; and at next Christmas to take the cross, and go in person into the Holy Land the following summer, unless he obtained a dispensation from the pope; to allow to the pope supreme jurisdiction in all matters relating to the clergy; and to do penance at the tomb of Becket, which Henry, after his arrival from France, performed in the following manner: 'Leaving Southampton, he took the road to Canterbury; and was no sooner in sight of that city, than, alighting from his horse, though yet at a league's distance, and pulling off his boots, he walked barefooted, in extreme pain, the road being purposely strewed with sharp gravel stones, to the holy tomb; where, after he had taken a little rest, he submitted to be scourged on the bare back with forty stripes by the prior and the monks of St. Augustine; after which he passed the night in prayer, lying on the pavement of the church; and next morning, after having attended a procession round the holy tomb, he set out for London.'

In the long interval between the Norman conquest and the era of the Reformation, a period of nearly 500 years, very few ecclesiastics occur worthy the attention of the historian, as any way remarkable for genius or learning. Thomas Bradwardine, arch-

bishop of Canterbury, was one. This learned and pious person was born about the middle of the reign of Edward I.; he studied at Oxford, and was one of the proctors of that university, in A.D. 1325. He was the greatest mathematician and theologian of his day. He was confessor to Edward III., and attended him in his French wars; he was chosen Archbishop of Canterbury by the monks, but Edward refused to part with him; however, soon after, being chosen a second time, Edward consented to the election. He did not long survive his consecration, but died seven days after his arrival at Lambeth Palace. It is only from his great work, entitled, The Cause of God against the Pelagians, that we are able to form a proper estimate of the piety, the deep humility, the metaphysical acumen, and argumentative genius of the man. John Wycliffe, rector of Lutterworth, was another eminent precursor of the Reformation; and contributed, by his life and writings, to pave the way for that great event, by the translation of the Scriptures into English. While divinity professor at Oxford he published certain conclusions against transubstantiation, the pope's infallibility; denied that the Church of Rome was the head of the other churches, that St. Peter had the power of the keys any more than any other of the apostles, and affirmed that the New Testament or gospel is a perfect rule of life and manners, and ought to be read to the people; that there were only two orders of spiritual rulers, viz. bishops and deacons; that all human traditions are superfluous and sinful; that religious ceremonies are unlawful, and that men ought not to be restricted to a prescribed form of prayer. All these opinions of Wycliffe were condemned at Rome, as might be expected, and positive orders were sent to England to stop the progress of Wycliffism. But the reformer, supported by the powerful protection of John, duke of Lancaster, though his books were burned, and himself deprived of his professorship, got leave to end his days in peace, at his rectory of Lutterworth. He wrote about two hundred volumes, all of which were called in, condemned, and ordered to be burned, together with his bones, by the Council of Constance, in 1415, nearly forty-one years after his death. But his doctrine remained; and his disciples, called Lollards, a nickname, as Mosheim observes, generally affixed to pious persons in these times, by their adversaries, as Pietist, Puritan, and Methodist in after times, increased after his death; although several sanguinary laws were passed against them by several successive Parliaments, and many, at different intervals, were committed to the flames.

ANCIENT ENGLISH INSTITUTIONS, CONDITION OF THE PEOPLE, &c.—For an account of the Anglo-Saxon institutions, and the condition of the people of England during the Anglo-Saxon period, see the article ANGLO-SAXONS.

Institutions under the Norman Kings.—The Norman conquest, by the introduction of the continental feudal system into England, caused a complete change in the mode of tenure of land, and led also to great alterations in the constitution of the army, the administration of justice, and the position of the king and church. The Domesday-book, compiled by order of William the Conqueror, is the great source of information referring to the internal administration of the country under the Normans. From this we learn that William divided the whole territory of the kingdom into 60,215 fiefs, the half of which were granted to civil superiors, while the other half were reserved for the crown and the church. These estates, along with right of possession in all the buildings erected upon them, all the revenues to be derived from them, and with a population corresponding to the size of the estate, either totally enslaved or only partially free, pledged to the payment of certain sums for protection, or in the way of taxes, and to the performance of certain services for their masters, were granted under the condition that they should return to the crown or the liege lord of the feudal tenant on the death of the latter without any heirs enjoying the right of feudal succession (escheat), or in case he were guilty of felony (forfeiture). The possessors of these fiefs were required to equip and support a number of heavy-armed horsemen proportionate to the size of the estate. About 1400 of the largest fiefs were granted to *crown vassals*, under the condition that, on being summoned by the king, they should themselves, with all their feudal dependents, gather round the king's banner, or if they happened to be churchmen (bishops or abbots) they should merely send their dependants. As the possessions of the crown vassals were often very large, and these 'great barons,' as they were called, were consequently bound to equip considerable bodies of heavy-armed soldiers, it became a common practice both among secular and ecclesiastical tenants to subdivide their fiefs into smaller ones, and let these off to other tenants on similar conditions to those under which their own estates were held. These vassals of the great barons were required to take an oath of allegiance not only to their immediate feudal superior, but also to the king as the superior of the whole land; and thus all the three grades of vassals, the great barons, the small barons, and the vassals of the great barons, were bound together by the common obligation of military service to the crown. This last grade consisted chiefly of proprietors of middle rank, who formed the gentry or inferior thanes among the Anglo-Saxons. The greater thanes had been mostly expelled from their holdings by the Norman invaders. In addition to these three classes the Domesday-book also makes mention of other two classes liable to military service, the freemen (*liberi*) and the sokemans, the former of whom at the time of compilation amounted to about 12,000 and the latter to 23,072. The 'freemen' were probably for the most part composed of representatives of the old 'ceorls,' or free peasant proprietors, who at one time formed the main strength of the Anglo-Saxon population. Although called free they cannot be regarded as having been really such, and still less entitled to that name were the sokemans. Upon both classes it was imperative that they should perform certain services to the lords of the land in which their possessions lay; only their estates were capable of being inherited by their sons of full age. The remainder of the ceorls had sunk to the condition of bondmen, whom the Normans designated by the contemptuous appellation of 'villeins.' They were a poor oppressed class, and can scarcely be considered as having been better situated than the slaves, who are also mentioned in the Domesday-book. Such was the feudal system as it was introduced into England by William the Conqueror, and as it continued to exist for about four centuries, until it almost fell to pieces during the wars of the Roses, and was finally extinguished in the reigns of Richard III., who passed a law to protect the rights of the buyer of an estate against the claims of the heirs of the seller, and of Henry VII., who passed another law with the same purpose, besides one prohibiting the nobles from keeping armed retainers.

The administration of the law and the constitution of the various courts of law in England did not suffer so great changes as were made in the mode of tenure of land and the structure of the army in consequence of the Norman supremacy in England. In accordance with an oath which William had taken

to maintain the good and approved laws of Edward the Confessor, he appointed men having a knowledge of the law to determine such laws and customs as had been in use in the time of the Saxon kings, and commanded that the law should be administered according to the same forms and principles as before the conquest. The tribunals of the hundreds, which during the most flourishing period of the Saxon rule had been held every month, and took cognizance of the smaller offences committed within the limit of their jurisdiction, had already, before the close of the Saxon period, lost a great deal of their importance, and thus it was natural that with the gradual disappearance of the free peasantry and the extension of the feudal relations to all ranks of society, the jurisdiction formerly held by the hundreds should pass to the lords of the manors. On the other hand the county courts, or scir-gemote, which met twice every year under the presidency of the ealdormen and scir-gerefas (sheriffs) to decide disputes that arose in each county, were still preserved during the Norman period. A royal court was now erected, which was to be supreme, and decide all disputes about crown fiefs. This supreme court rapidly grew in importance, as complaints were frequently made of the arbitrariness and partiality of the judges in the county courts, and appeals to the supreme court became common. The ancient Germanic institutions of compurgators, trials by ordeal, weregeld, and frank pledge (or pledge of peace, as the term originally was), according to which the tithings into which the hundreds were divided were jointly responsible for each of their members, were still retained under the Normans. The chief innovations made under the Normans in the administration of the law were the institution of travelling courts and the civil jury. The former was an institution by which each sheriff was required to pass at least twice every year through all the hundreds in his county, and as the royal representative pronounce sentence on minor offenders. The institution of the civil jury enabled the parties in a suit about a disputed possession or succession, instead of appealing to trial by combat, to have their claims settled by a commission of lawyers. The municipal rights of towns and cities grew out of their separation from the jurisdiction of the ealdormen and sheriffs. Of the more important towns which bore the title of cities (civitates), in contradistinction to the towns and boroughs, the king reserved the greater number to himself after the completion of the work of conquest. Only a few were handed over to the separate crown vassals. The following are mentioned in the Domesday-book as fortified places: Canterbury, Nottingham, York, Oxford, Hereford, Leicester, Stafford, Chester, Lincoln, and Colchester. The inhabitants of towns were required to pay a sum of money into the royal treasury, to pay duties on all merchandise entering or leaving the towns, and to furnish aid in money to the king in all emergencies. In return they received from the king various privileges, and as they increased in times of peace in number and prosperity they gradually acquired the right of self-government under royal officers. The towns were the nuclei in which a new class of society arose out of the old freemen, sokemans, and villeins.

For an account of the state of the church under the Normans see the previous sketch of church history.

Slavery.—Mention has been made in the preceding account of English institutions under the Normans, of the existence of slavery in England. Slavery was practised in England both before and after the coming of the Anglo-Saxons, as well as under the Normans, and slaves formed a very valuable article of exportation from England to all parts of the Continent. It was the sight of a number of English slaves in the market at Rome that inspired Gregory the Great with the resolution of attempting the conversion of their countrymen to the Christian faith. The mildest fate that prisoners could expect in the long-continued wars of the British and Saxons between the several kingdoms of the heptarchy, and between the English and Danes, was to be sold as slaves. The Jews were the principal slave merchants, and found a good market for their slaves among the Saracens in Spain and Africa. The exportation of slaves continued to the Norman Conquest, and the city of Bristol was a noted emporium of this ignominious and cruel traffic. The influence of Christianity, however, was gradually effective in putting a stop to the practice of holding slaves. Several laws and canons of the church were made in England against selling Christian slaves to Jews or pagans; and it was a common practice for the priests to exhort those who were near death to release their slaves if they had any, in order to secure their salvation. Thus it happened that the whole population in course of time enjoyed their liberty, without the necessity of any active endeavours on the part of the enslaved portion of the population to liberate themselves.

Learning and Education.—That Roman learning had made some way at least in some of the chief centres of Britain before the arrival of the Anglo-Saxons, may be inferred from the fact that Pelagius, the great heresiarch of the fourth century, and St. Patrick, the great Christian missionary of the end of the fourth and the beginning of the fifth century, are both said to have been Britons. Of the state of learning during the time of the Saxons but little is known, and that little does not relate to any continuous period. The seventh and eighth centuries were the brightest in this respect in Saxon England, and during this period England furnished the Continent with some of the most learned teachers of the time. Even then, however, this learning was confined to the clergy. In the following century the ravages of the Danes began, and in the troublous times that followed learning became extinguished. So much was this the case, that Alfred the Great, when a young man, could find no instructors in any of the higher branches of learning; and at the time of his accession to the throne there was hardly a person to the south of the Humber who understood the common prayers of the church, or who was capable of translating a single sentence of Latin into English. During the first part of Alfred's reign (871–878) he was too much occupied in attempting to free his country from the Danes to be able to devote any attention to enlightening the darkness of the time; but after he had restored peace to his dominions by his victory over Guthrum in the latter year, he began to study the Latin language himself, and to encourage learning among his clergy. He invited to his court the most learned men to be found in any part of the country, and even brought teachers from foreign countries. It is not unlikely that he re-established many of the old monastic schools, and his biographer Asser states that he founded a seminary for the sons of the nobility, and that he set apart an eighth part of his whole revenue for its endowment. Some have maintained, although apparently on insufficient grounds, that out of this seminary grew the University of Oxford. The schools founded by Alfred were probably maintained under his successors during the tenth century; but at the close of that century, when the ravages of the Danes began again in the reign of Ethelred, it is probable that all learning again disappeared; and it may with

equal probability be inferred that when the country again obtained peace under Canute schools began once more to flourish. The subjects generally taught in the schools of those times appear to have been grammar, the Greek and Latin languages, astronomy, and theology. Although, as has been stated, it is not improbable that schools may have been in existence during the period of Danish rule and in the reign of Edward the Confessor, the state of learning at the time of the Conquest appears to have been very low even among the clergy, so as to furnish William the Conqueror with a plausible pretext for depriving many of the ecclesiastics of England of their benefices, and supplying their places with more learned men brought from the Continent. The efforts of William were directed towards raising the standard of learning in England by showing favour to the church, founding monasteries, and giving an example to his subjects by taking care that his own son Henry Beauclerc should be well educated. Lanfranc, an Italian, whom William appointed to the see of Canterbury, and Anselm, who succeeded Lanfranc in 1093, were both zealous in the cause of education. Schools were established in connection with all the cathedrals and monasteries in the kingdom; and influenced by the example of the Normans, the English among whom they were settled began to display a considerable degree of intellectual activity, the result of which was that in the course of the two centuries that followed a considerable body of Latin literature was produced in England, partly by Anglo-Normans, but to a great extent also by native English. The schools here referred to as established in connection with the religious houses throughout the kingdom, were almost exclusively intended for those who wished to make the church their profession, and it was not thought necessary to make any provision for educating the laity in the higher branches of learning. Learning, indeed, was customarily looked upon as almost the exclusive right of the clergy; and they themselves cherished the same feeling, and treated the unlearned laity with the greatest contempt. The wants of the laity were not, however, left entirely unprovided for. In addition to the schools connected with the religious houses others were erected for their benefit, but they were merely intended to provide instruction in the elementary branches of education. It ought to be mentioned that the instruction given in the schools in England for some time after the Conquest was conveyed in the Norman French language. The reason for this was that the great majority of the schoolmasters were clergymen, and accordingly belonged to the number of those Normans that had been invested with most of the ecclesiastical benefices. Pinkerton fixes upon the time of Edward III., the period of overt hostility between France and England, as the time when the French language began to be generally disused in England.

The two great universities, Oxford and Cambridge, that have ever since been the chief seats of learning in England, did not, in all probability, exist in any form in which the name of universities was applicable to them, until the twelfth century, although there can be no doubt that schools of some note had existed at both these places long before that date. As the instruction in the common schools was given in the French language, the language used at the universities was Latin both for lectures by the professors and for exercises and disputations among the students.

CHURCH OF ENGLAND.—The established religion in England is Episcopacy. The sovereign is the supreme head; by this authority he convenes and prorogues the convocations of the clergy. The church is governed by two archbishops and twenty-six bishops. The Archbishop of Canterbury is styled the *primate of all England*, and to him belongs the privilege of crowning the kings and queens of England. The province of Canterbury comprehends twenty-one bishoprics. In the province of the Archbishop of York, who is called the *primate of England*, there are four bishoprics. Archbishops and bishops are appointed by the king, by what is called a *congé d'élire*, or leave to elect, which is sent to the dean and chapter naming the person to be chosen. The archbishops and bishops (but only to the number of twenty-four) have seats in the House of Lords, and are styled the *spiritual lords*. The archbishops have the title of *grace*, and *most reverend father in God by divine providence;* bishops are addressed by the title of *lord*, and *right reverend father in God by divine permission*. The former are said to be *enthroned*, the latter *installed*. To every cathedral belong several prebendaries and a dean, who form the dean and chapter or council of the bishop. The next order of the clergy is that of archdeacons; subordinate to the bishop, their office is to reform abuses and to induct into benefices. The most numerous and laborious order of the clergy are the deacons, curates, vicars, and rectors. The office of the deacon is confined to baptism, reading in the church, and assisting the priest at the communion. A parson is one who has full possession of all the rights of a parish church; if the great tithes are *impropriated* the priest is called a *vicar;* if not, a *rector;* a *curate* is one who is not instituted to the cure of souls, but exercises the spiritual office in a parish under a rector or vicar. The doctrines of the Church of England are contained in the thirty-nine articles: the form of worship is directed by a liturgy.

The first steps to the establishment of the English Church were slow. In 1531 the convocation of the clergy addressed a petition to King Henry VIII. as the chief protector and only and supreme lord of the English Church. Not very long after, the Parliament abolished appeals to the see of Rome, dispensations, licenses, bulls of institution for bishoprics and archbishoprics, the payment of Peter's-pence, and the annates. In 1534 the convocation of the clergy and the two universities declared that the bishop of Rome had no more jurisdiction in England than any other foreign bishop. In the same year the Papal authority was set aside by act of Parliament, and by another act of Parliament, passed in 1535, Henry assumed the title of supreme head of the Church of England. But these acts, although they severed the connection between the English Church and the holy see, did not alter the religious faith of the church. Henry VIII. desired to make scarcely any change in the dogmas or rites of the church, and put to death those who were not content to accept the modified catholicism which he formulated in the six articles (promulgated in 1539), and wished to make still further innovations on the ancient faith than he himself did, as well as those faithful Catholics who continued to recognize the supremacy of the pope. The articles of faith of the new church were declared to consist in the Scriptures and the three creeds, the Apostolic, the Nicene, and the Athanasian (see CREED); the real presence, the use of images, the invocation of saints, &c., were still maintained. Under Edward, the duke of Somerset, the protector of the realm during the minority of the king, caused a more thorough reform of the doctrines and ceremonies of the church to be made. At his instigation Parliament repealed the statute of the six articles (1547), and in 1551 a new confession of faith was embodied in forty-two articles, denying the infallibility of councils, keeping only two sacra-

ments, baptism and the Lord's supper, and rejecting the real presence, the invocation of saints, prayer for the dead, purgatory, and the celibacy of the clergy. At the same time a new liturgy was composed, in which English was substituted for Latin. With the reign of Mary the old religion was re-established; and it was not till that of Elizabeth that the Church of England was finally instituted in its present form. The doctrines of the church were again modified, and the forty-two articles were reduced to thirty-nine by the convocation of the clergy in 1563. As no change was made in the episcopal form of government, and some rites and ceremonies were retained which many of the reformed considered as superstitious, this circumstance gave rise to many future dissensions. The controversy concerning the ceremonial part of divine worship commenced with those exiles who, in 1554, fled from the persecutions of Queen Mary, and took refuge in Germany. On the accession of Elizabeth they returned, and renewed the contest at home which had begun abroad. These were called *Puritans*, and at one time comprised many distinguished members of the English clergy. (See PURITANS.) During the reign of Elizabeth they met with no toleration. In 1559, before the close of the first year of her reign, two acts were passed with the object of bringing about the entire subjection of the church and the people in religious matters to the royal authority. These were the Act of Supremacy and the Act of Uniformity. The former required all beneficed ecclesiastics, and all laymen holding office under the crown, to take the oath of supremacy, renouncing the jurisdiction, whether spiritual or temporal, of every foreign prince or prelate; the latter made it incumbent on every clergyman, whether beneficed or not, to use no other than the established liturgy, and imposed a fine on all who absented themselves from church on Sundays and holidays. On the accession of James the Puritans hoped for some relief; but an Episcopal hierarchy was more favourable to his views than the Presbyterian form of government, and he publicly adopted the maxim 'No bishop, no king.' When the English divines returned from the Synod of Dort (1618–19) the king and the majority of the Episcopal clergy discovered an inclination to the sentiments of Arminius which have since prevailed over Calvinism among the English clergy. Under Charles I. the attempts made, through the instrumentality of Laud, to reduce all the churches of Great Britain under the jurisdiction of bishops, and the suppression of the opinions and institutions that were peculiar to Calvinism, cost the Archbishop of Canterbury his head, and had no little effect in imbittering the civil contest between the throne and the Parliament. After the death of Laud the Parliament abolished the Episcopal government, and condemned everything in the ecclesiastical Establishment that was contrary to the doctrine, worship, and discipline of the Church of Geneva. As soon as Charles II. was restored to the throne the ancient forms of ecclesiastical government and public worship were restored; and three important acts were passed in his reign tending to exalt the authority of the church. The first of these was the Corporation Act of 1661, requiring, among other things, that none should be elected to a magistracy, or to any office of trust in a corporation, who had not taken the sacrament within one year before their election, according to the rites of the Established Church. The second was the Act of Uniformity, passed in 1662, requiring every beneficed clergyman, and even every fellow of a college, and schoolmaster, to declare his full assent to everything contained in the Book of Common Prayer, and excluding all who refused to observe the rites and subscribe the doctrines of the Church of England from its communion. The third was the Test Act, passed in 1673, which enacted that every person appointed to hold a temporal office of trust should take an oath against transubstantiation. In the reign of William III., and particularly in 1689, the divisions among the friends of Episcopacy gave rise to the two parties called the *high-churchmen*, or *non-jurors*, and *low-churchmen*. The former maintained the doctrine of passive obedience, or non-resistance to the sovereign under any circumstance whatever; that the hereditary succession to the throne is of divine institution, and cannot be interrupted; that the church is subject to the jurisdiction of God alone; and, consequently, that certain bishops, deposed by King William, remained, notwithstanding, true bishops; and that those who had been appointed in their places were rebels and schismatics, and all who held communion with them were guilty of rebellion and schism. The gradual progress of civil and religious liberty, during the last 150 years, has settled practically many such controversies. The great increase of the Dissenters in recent times (they are not much less numerous than the members of the Established Church) has led to new concessions in their favour; and especially to the repeal of the corporation and test acts (by Act 9 Geo. IV. cap. xvii. 1828); the Catholic emancipation (in 1829); and the opening of the universities in England to Dissenters (1871).

The thirty-nine articles, as the established confession of the English Church, deserve a short analysis. The five first articles contain a profession of faith in the Trinity; the incarnation of Jesus Christ, his descent to hell, and his resurrection; the divinity of the Holy Ghost. The three following relate to the canon of the Scripture. The eighth article declares a belief in the Apostles', Nicene, and Athanasian creeds. The ninth and following articles contain the doctrine of original sin, of justification by faith alone, of predestination, &c. The nineteenth, twentieth, and twenty-first declare the church to be the assembly of the faithful; that it can decide nothing except by the Scriptures. The twenty-second rejects the doctrine of purgatory, indulgences, the adoration of images, and the invocation of saints. The twenty-third decides that only those lawfully called shall preach or administer the sacraments. The twenty-fourth requires the liturgy to be in English. The twenty-fifth and twenty-sixth declare the sacraments effectual signs of grace (though administered by evil men), by which God excites and confirms our faith. They are two: baptism and the Lord's supper. Baptism, according to the twenty-seventh article, is a sign of regeneration, the seal of our adoption, by which faith is confirmed and grace increased. In the Lord's supper, according to article twenty-eighth, the bread is the communion of the body of Christ, the wine the communion of his blood, but only through faith (article twenty-ninth); and the communion must be administered in both kinds (article thirty). The twenty-eighth article condemns the doctrine of transubstantiation, and the elevation and adoration of the host; the thirty-first rejects the sacrifice of the mass as blasphemous; the thirty-second permits the marriage of the clergy; the thirty-third maintains the efficacy of excommunication. The remaining articles relate to the supremacy of the king, the condemnation of Anabaptists, &c.

ENGLISH ART. *Architecture.*—Numerous so-called Druidical stones, a few rude towers, and some other mysterious structures, are the only remains of the architecture of the ancient Britons. The only monuments of the Roman occupation of the country are the ruins of military works, such as roads and

fortified walls that had been executed on a magnificent scale. Very little can be said with regard to the style that prevailed in England between the invasion of the Anglo-Saxons and the Norman conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. There was not a single cathedral built before that date but was rebuilt during the Norman period, or at some later time, and although there are traces in numerous churches of pure Saxon architecture, there is no entire church now standing which was built during the Saxon period. There is thus little known about this style beyond the fact that it was a variety of Gothic, probably rather rude. The Normans introduced a more highly developed kind of Gothic, the style in which most of the English cathedrals are built. The earlier specimens of this style of architecture in England, such as may be seen in parts of the cathedrals of Rochester, Winchester, and Canterbury, naturally exhibit no distinctively English features, but resemble on all points the works executed in the same style on the Continent. It was not till the beginning of the twelfth century that the new architecture began to assume a character of its own peculiar to England. Durham Cathedral affords the best illustration of this style. The ogive or pointed arch appears to have been introduced into English architecture in the second half of the twelfth century, and the first traces of its use are to be found in the cathedrals of Canterbury, Rochester, and Northampton. This new modification of Gothic architecture soon made way for itself, although it appears to have been adopted with some reluctance in England. In the end it became the prevailing and even the sole style of ecclesiastical architecture in England, the round arch being entirely disused for three centuries. Among the edifices erected in this style between the twelfth and fifteenth centuries may be mentioned the cathedrals of York, Wells, Winchester, Lichfield, Worcester, Chichester, Lincoln, Westminster, &c. The most characteristic peculiarity of Gothic architecture in England, after the introduction of the pointed arch, consists in the form of the windows in which the mullions rise right up to the main arch of the window, and are often crossed by horizontal bars. This peculiarity has caused the name of perpendicular to be given to the style of architecture in which it is found. The Tower of London, Windsor Palace, and the great hall of the palace of Edward III., are the finest specimens of military and civil architecture belonging to the same period as the religious edifices above-mentioned. The Renaissance style of architecture made its appearance under the Tudors, and was associated with the Gothic. The palaces of Richmond and Hampton Court, the chapel of Henry VIII., and the tombs of Queen Mary and Queen Elizabeth at Westminster, Bishop West's chapel in the cathedral of Ely, and the six coffins placed by Bishop Fox round the choir of the cathedral of Winchester, are the principal examples of this mixed style, in which are wanting both the elegance in details and the capricious fancy which distinguish the productions of continental art during the same epoch. In the reign of Charles I. Inigo Jones designed, among other buildings, St. Paul's at Covent Garden and Greenwich Hospital in a peculiar style, imitating the Græco-Roman. Architecture, neglected under the Commonwealth, revived after the Restoration, when Sir Christopher Wren designed an immense number of buildings, particularly St. Paul's Cathedral at London, the towers of Westminster, the Sheldonian theatre of Oxford, Chelsea Hospital, &c. Other architects of his time were not less productive. Among them are Gibbs* and Sir John Vanbrugh. In the eighteenth century the style of Louis XV. prevailed in England. The most celebrated architects of the time were W. Chambers and Robert Taylor. At the present day English architects are in the habit of copying indifferently from all styles, and sometimes even mix up different styles in the most monstrous fashion. The most striking novelty in architecture in the nineteenth century is the method of building in glass and iron, first resorted to by Sir Joseph Paxton in the case of the building constructed for the International Exhibition of 1851, and subsequently adopted in the Crystal Palace and various other structures.

Painting and Engraving.—Very little is known of the state of the art of painting among the Anglo-Saxons. In the seventh century, Biscop, abbot of Wearmouth, brought from Italy a large number of pictures with which he adorned the churches dependent upon his monastery. In the ninth century Alfred the Great, with the view of refining his warlike subjects, caused numerous manuscripts to be made and adorned with miniatures. Towards the end of the tenth century, Dunstan, archbishop of Canterbury, had the reputation of being an expert miniature painter, and some of his illuminations are preserved in the Bodleian Library at Oxford. Under the reign of William the Conqueror, and those of his two sons, the painting of large pictures began to be studied. Lanfranc, archbishop of Canterbury, a native of Lombardy, one of the most renowned men of letters of his time, adorned the vault of his church with paintings of ravishing beauty, to use the expression of a chronicle of the period. Numerous miniatures of the thirteenth and fourteenth centuries have come down to us: the execution is rude, but the style does not want originality. From this period down to the eighteenth century there were few native painters, and scarcely any of any importance in England. A succession of foreign painters were attracted to the country by the munificence of some of the English sovereigns, and of the English aristocracy, but no native talent was developed in this direction. Among these foreign painters connected with England may be mentioned Hans Holbein, a German painter, who enjoyed the favour of Henry VIII.; Federigo Zuccaro, an Italian, who came to England in the reign of Queen Elizabeth, and painted at her court; and Sir Antony Vandyck, the great Flemish portrait-painter, who lived at the court of Charles I. There is one native English painter deserving of mention who appeared before the close of the seventeenth century, although even his chief works belong to the eighteenth. This was Sir James Thornhill (1676–1734), the painter of the cupola of St. Paul's in London, and of the Painted Hall in Greenwich Hospital. The period of the decline of the art on the Continent was the time when England attained her highest eminence in it. When there was no longer any art in Italy, Spain, Germany, Flanders, and Holland, and when France alone of continental countries possessed some painters of lively fancy, there suddenly appeared in London a painter of original and consummate genius, who may almost be said to have created a new kind of painting, in which the artist exhibited the qualities of a moralist and satirist combined with those of the painter; and he was closely followed by two portrait-painters, whose portraits rivalled, in point of elegance, those of Vandyck. The first of these was William Hogarth (1697–1764); the two latter, Sir Joshua Reynolds (1723–92) and Thomas Gainsborough (1727–88). Gainsborough was a distinguished landscape as well as a portrait painter. Throughout the eighteenth century portrait-painting was the most brilliant specialty of the English school. At the same time that Reynolds

* Scottish.

and Gainsborough flourished there lived also George Romney (1734–1802), who almost equalled them in excellence, and a little later Sir Henry Raeburn* (1756–1823), a painter endowed with some share of the vigour of Velasquez, and Sir Thomas Lawrence (1769–1830), who attained more nearly than any other painter to the elegance of style of Sir Joshua Reynolds. He succeeded Sir Joshua in 1792 as court-painter. The names of Barry,† Opie, and Copley may also be mentioned among those who manifested more talent in the painting of simple portraits, than in the historical composition which they attempted.

There also flourished during this century Richard Wilson (1713 or 1714–82), a Welsh landscape-painter in the style of Claude and Poussin, and Benjamin West (1738–1820), an historical painter, who, though American by birth, deserves to be mentioned here from the fact of his having come early to England, and having been connected with England during the most of his life. He merits remembrance not only on account of his distinction as a painter, but also on account of what he did towards diffusing a taste for the fine arts among the English public by helping to organize exhibitions of paintings.

Hogarth had no immediate successor in the painting of familiar scenes of daily life. This kind of painting was revived with great effect at the beginning of the present century by Sir David Wilkie* (1785–1841), one of the most popular and most highly esteemed of English artists. He made his first appearance at the Academy Exhibition of 1806 with his Village Politicians, and since that date the class of paintings in which he excelled has been the favourite one with most English painters, and that in which they have attained the greatest eminence. Among the painters who have followed in the footsteps of Wilkie may be mentioned William Mulready† (1786–1863); Charles Robert Leslie (1794–1859); Daniel Maclise† (1811–70); John Phillip* (1817–67); William Powell Frith (born 1819); Thomas Faed* (born 1826); William Holman Hunt (born 1827); John Everett Millais (born 1828 or 1829). The two last were among the founders of the pre-Raphaelite school of painters, the distinguishing characteristic of which is extreme fidelity in matters of detail. The chief historical painters of the present century include William Etty (1787–1849) and Benjamin Robert Haydon (1786–1846); by far the most celebrated landscape-painter is Joseph Mallord William Turner (1775–1851); and Sir Edwin Landseer (1803–73) is the most distinguished animal-painter that this country ever produced. Of late years water-colour painters have greatly increased in England; among them are Corbould, Cattermole, Louis Haghe, Wehnert, Prout, Gilbert (also an oil-painter), &c.

Until the eighteenth century engraving was not cultivated at all in England except by foreign artists. The German engraver, Wenzel Hollar (died 1677), was the most distinguished engraver in England in the seventeenth century. Alongside of the national school of painters, created in the eighteenth century by Hogarth, Gainsborough, and Reynolds, there arose almost simultaneously an English school of engravers. Hogarth himself acquired some distinction in the art of engraving; but those who were more specially devoted to this branch of art were Sir Robert Strange* (1721-92), Richard Earlom, John Mark Ardell† (died at an early age in London in 1765), and Valentine Green (1739–1813). The last three were mezzotint engravers, and carried the art to a high degree of excellence. The most celebrated line-engravers in the period immediately subsequent to that during which those just mentioned lived were William Sharp (1749–1824), James and Charles Heath (the former died 1834, the latter 1848), and Fittler (1756–1835), all at the end of the last and the beginning of the present century. Towards the end of the last century the stipple style of engraving was introduced by an Italian, Francesco Bartolozzi, and since that period it has been followed by a good many English engravers. In 1775 Thomas Bewick (1753–1828) revived engraving on wood, a style which has since been very extensively resorted to for the illustration of periodical and other works. The most distinguished of his followers in this style is Luke Clennell (1781–1840). Among more recent English engravers (some still living) are George Doo, John Burnet,* Samuel Cousins, William Holl, Edward Goodall, John Henry Robinson, and John Pye. In steel-engraving English artists have acquired a decided superiority over those of other countries. In lithography, too, some of the English artists have displayed genuine talent. Among the best works which have appeared in this department may be mentioned the collections of architectural views of England and Belgium by Haghe and Nash.

Sculpture.—Cæsar records that the ancient Britons were fond of cutting out ornaments of various kinds on their chariots of war, but that they were entirely ignorant of the art of casting statues in metal, or cutting them in stone. The ivory drinking-horn of Ulfus preserved at York is said to be the only specimen of carving that has come down to us from the time of the Anglo-Saxons. After the Norman Conquest the arts of carving and sculpturing were practised only by foreign artists, Frenchmen and Italians, and it was not till the thirteenth century that some remarkable works began to be produced by native artists. At this epoch, however, the arts of carving and sculpture were still regarded merely as handmaids to architecture. These arts received a check during the wars of the Roses, and were not again cultivated till the Renaissance period, when Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII., and that of Henry himself, at Westminster. The troubles of the reign of Charles I. and the Commonwealth produced a new stagnation in the art; and what is more to be regretted, were the cause of the destruction of many valuable works of art in this department. After the Restoration two sculptors of some note appeared in England, Grinling Gibbons, a wood-carver, born at Rotterdam, and Caius Gabriel Cibber, who, though ridiculed by Pope, was a man of real talent. During the eighteenth century there was no English sculptor of eminence till John Flaxman (1755–1826) appeared to resist the false taste of the time. His monument to Lord Mansfield, and his statues to Pitt and Reynolds, are among the finest productions of English sculpture. He had for rival and successor Sir Francis Chantrey (1781–1841), who acquired renown by the statues which he made of most of the eminent men of his time. John Carew, Lawrence Macdonald,* Sir Richard Westmacott (1775–1856), Edward Hodges Baily (1788–1867), John Gibson (1790–1866), and John Steel (born 1804), are a few of the sculptors of the nineteenth century, to whom we should not forget to add J. H. Foley, W. C. Marshall, P. MacDowell, and H. Weekes, as among the first sculptors of the present time. Sculptors of the English school in general are characterized by a sort of romantic grace which is their distinguishing mark, and by extraordinary delicacy and finish in detail; but they exhibit great weakness in the modelling of naked parts, especially in female figures.

* Scottish. † Irish.

* Scottish.

LANGUAGE AND LITERATURE.—1. *Language.* The English language is a direct development of the Anglo-Saxon, a circumstance which makes it questionable whether the latter speech ought to be distinguished by a separate name. But although a direct development of the Anglo-Saxon, it is not a development which has been allowed to take place regularly and gradually, as the result merely of internal causes. One important external influence was brought to bear on the original form of our language, which had the double effect, first, of producing a much more sudden and complete modification of the grammatical structure than could have taken place if the language had grown up independently of foreign influences; and secondly, of giving a composite character to the vocabulary of the language by the introduction of a large number of foreign words. This external influence was the Norman Conquest, in consequence of which a new language, the Norman-French, came to be spoken in England by those who had made themselves the masters of the country, and who formed, therefore, almost the only class that had leisure and opportunity for literary pursuits. The immediate result of the Norman Conquest (1066) was thus that the language of the Normans came to be the chief literary language of England (except where Latin was used), and that the Anglo-Saxon was reduced to a very subordinate place. When the latter language again comes into notice as a written language, a great change is seen to have been wrought in it. Before the Conquest it was a very highly-inflected, or what is called a synthetic language, that is, one in which the substantives, adjectives, verbs, and articles are subject to numerous modifications, each of which expresses a modification of the root-meaning of the word, or shows the relation of the word to the other words in the sentence. During the period when Anglo-Saxon ceased to a great extent to be a written language these inflections dropped off; and when it re-emerges as a written language about the end of the twelfth century, it is no longer synthetic, but analytic, that is, prepositions and auxiliaries are now used instead of inflectional prefixes and terminations to express the various modifications of the idea contained in any word, and the relations of the words in a sentence to one another. At this period, however, the language still continues to be essentially homogeneous in respect of its vocabulary: the Norman words that occur are so rare that they need not be taken into account. And it was natural that it should be so, for the Saxon language was still confined to the Saxon inhabitants of the country; and those who wrote in it addressed themselves only to that portion of the community, and accordingly had no occasion to use any word of Norman origin. This state of matters lasted till about the middle of the thirteenth century, which is the period at which English proper is usually regarded as having begun to be spoken and written. By this time the Normans began to experience the inconvenience of not being acquainted with the language of the people among whom they dwelt, and in learning to speak and write it they very naturally used a large number of Norman words, and these words were adopted by all such writers belonging to the subject race as wished to make themselves understood by Norman as well as by Saxon readers. A very rapid mixing of the two languages thus took place, and a second important change was wrought in the English language. It is no longer homogeneous in its vocabulary, but contains a large admixture of foreign words. The whole of what precedes may be shortly summarized thus:—From 450 to 1066 the language spoken in England was the so-called Anglo-Saxon, a dialect of Low German, very highly inflected. From 1066 to 1250 two languages were spoken in England, Anglo-Saxon and Norman-French, by two different sections of the population occupying different political positions. During this period the grammatical structure of the former language began to be broken up, chiefly owing to its being disused for literary purposes; and towards the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by the homogeneousness of its vocabulary. This form of our language is usually called Semi-Saxon. Finally, about 1250 the two languages begin to mingle, and form one intelligible to the whole population, Normans as well as Saxons. This is what is usually called English proper. English is thus seen to be a composite language, deriving part of its stock of words from a German source, and part from a Latin source, Norman-French being in the main merely a modified form of Latin. The changes that have taken place in the English language subsequently to 1250 are by no means as striking as those which took place in the transitional period between 1066 and 1250. Some few inflections which the English of the thirteenth and fourteenth centuries still retained have now been dropped, but the chief change which the language has experienced consists in its gradual growth and expansion in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. This growth has been going on at all times, but there are some periods which may be pointed out as more remarkable than others for the rapidity with which it proceeded. Such a period was the end of the sixteenth and the beginning of the seventeenth century, the period of the Reformation and following the revival of learning, when numerous words of Latin origin were introduced by scholars directly from that language, instead of through the French, the channel through which most of the Latin words previously found in the language had come. Another such period is the present, when the rapid growth of the sciences already existing, and the creation of new sciences, have caused whole groups of words to be introduced, chiefly from the Greek.

It would scarcely be in place here to discuss the various excellencies and defects of the English as compared with other languages, but we may mention the following as among the qualities which the English language is generally allowed to possess. 1. Strength and expressiveness, adapting it admirably for poetical composition. 2. Copiousness. In connection with this may be noted the extraordinary receptivity of the language, that is, its capacity for adopting new words from all sources, and of naturalizing them at once, so that they may be treated without any appearance of strangeness entirely as native English words. 3. Simplicity in form and construction. 4. Great flexibility, or adaptability to all kinds of composition, the grave and gay, the impassioned and calm, forcible and tender, sublime and ludicrous.

In connection with the subject of the English language, we may here further observe, that England and the United States of America offer the first instance in history of two great, independent, and active nations having *a common language*, but situated at a great distance from each other, and daily developing new and characteristic features. These relations must, sooner or later, exert a powerful influence upon the common language; for no language is so stable as not to undergo continual changes, if spoken by a people in the full vigour of social and political life. This state of things has already produced some effect on the English language; but from

the deep and natural interest felt by Americans in the literature of England, which must be a part of their own as long as Shakspeare and Milton shall live in their works, the effect has hitherto been inconsiderable, and not greater than we should expect from the mere circumstance of so different and remote local situations. The most material difference, probably, has been in the pronunciation of the language, which, however important in our daily conversation, is of secondary importance in relation to the literature and written language of the two countries. It has often been observed by English travellers and others that the pronunciation of the United States is far more uniform than that of England; and so nearly alike everywhere, that the people of any one town or district are perfectly understood in every other part of the country, which is not true of the lower ranks in England. When considered more minutely, however, there has for a long time existed a marked distinction between the pronunciation of the New England and Southern states.

The *orthography* of our language has undergone no material change in America, it being the general inclination to follow that of the best English writers of the age. But English orthography is so irregular, particularly in the use of the vowels, as to form the chief difficulty to a foreigner in learning our language, which is in other respects generally regarded as easy of acquisition. The *signs* of the sounds are so inconstant that they do not, when first heard by a foreigner, impress themselves on the memory so distinctly as those of the other European languages do, and of course cannot be so easily remembered for future use. To this embarrassment is to be added our custom of throwing back the accent to the first syllables of words, which necessarily produces that hurried and indistinct utterance of which foreigners so justly complain. For further information respecting the English language, see the article ANGLO-SAXON.

2. *Literature.*—Under this head it is necessary to speak not only of the literature contained in the English language, but also of all that has proceeded from writers who were natives of England, Scotland, or Ireland, whatever may have been the language in which their works were composed. Before any English literature, in the restricted sense of the term, existed, four literatures had arisen in England, of each of which we have some remains, although in the case of one of them, at least, these are rather scanty. The four literatures now alluded to are the Celtic, Latin, Anglo-Saxon, and Anglo-Norman.

The Celtic literature is divided into two branches, the Gaelic and the Cymric. Of the former we have a few remains both in prose and verse, the prose consisting partly of imaginative tales or romances, and partly of annals or chronicles of events of Irish history, and the verse of hymns and other religious as well as secular poems. A number both of the prose and verse pieces in Gaelic receive the name of Fingalian or Fenian, because they celebrate a legendary hero of the name of Fingal, or Finn Mac Cumhal. Of the other branch of the Celtic literature the chief remains are those ascribed to the four great bards of the Welsh, Aneurin, Taliesin, Merddhin or Merlin, and Llywarch Hen or Llywarch the Aged. All of these belonged to the sixth and seventh centuries. The authenticity of the remains ascribed to them has been much disputed. Another group of Welsh bards flourished during the twelfth, thirteenth, and fourteenth centuries, but these are by no means so celebrated as the first. In prose, besides chronicles, a code of old Welsh laws, and a large body of triads, that is, notices of historical events, or observations of a general nature, arranged under some common heading in groups of three, there is a collection of imaginative tales, many of which belong to a cycle dealing with the deeds of Arthur, a legendary hero like the Finn Mac Cumhal of the Gaels.

Until the fourteenth century the Latin literature produced in England bore a very considerable proportion to the whole body of literature belonging to that country, and in some departments of literature (theology, philosophy, science, &c.) what was written in Latin had a decided preponderance over what appeared in any other language. The most important of the Latin writers belonging to this period, who were natives of England, Scotland, or Ireland, are Bede, called 'the Venerable' (672 or 673 to 735), a Northumbrian monk, theologian, and scholar; Winfrid, or Boniface, the 'Apostle of the Germans,' who flourished during the first half of the eighth century; Alcuin (735–804), a theologian, scholar, and poet, and minister to Charlemagne; Joannes Scotus Erigena, a philosopher of the ninth century; King Alfred the Great; William of Malmesbury (about 1095–1143), an historian; Geoffrey of Monmouth (died 1154), the celebrated compiler of British legendary history; Nicholas Breakspear (Pope Adrian IV., the only English pope, 1100 to 1159); Giraldus Cambrensis, or De Barri (died after 1218), an historian and scholar; Matthew Paris (died 1259), an historian; Michael Scott, a Scottish scholar and occult philosopher of the thirteenth century; Roger Bacon (1214–1292), a philosopher and man of science; John Duns Scotus (died 1308), a scholastic theologian; and William Occam (died about 1350), another schoolman, the founder of the sect of the Nominalists.

As there is a separate notice of the Anglo-Saxon literature in the article ANGLO-SAXONS, it is enough to mention here the names of Cædmon, Bede, King Alfred, Aldred 'the Glossator,' and St. Dunstan among the writers of pure Saxon, referring to the article mentioned for more detailed information. In the language which in the preceding sketch of the history of the English language has been called Semi-Saxon there are three works of some importance still extant. These are:—1. Layamon's Brut, a metrical chronicle of legendary British history, consisting of 32,000 verses (about three times as many as Paradise Lost), and compiled chiefly from the French by a Worcestershire monk named Layamon who lived about 1200; 2. The Ormulum, containing 20,000 verses, a long paraphrase of Scripture, with a commentary, prepared by a monk called Orm or Ormin before the middle of the thirteenth century; 3. The Ancren Riwle, the 'Rule of the Anchoresses,' a collection of rules for monastic life written in prose by an unknown writer about 1250.

The literature to which the name of Anglo-Norman is given is that which was written in the Romance tongue called the Langue d'Oil, of which modern French is a development, by writers of Norman descent, who were either natives of England, or although born in Normandy lived during the time when that duchy was closely connected with England. The prevailing character of the Anglo-Norman literature is a tendency towards narrative composition either in prose or verse. From the writers who come under this head the following, all belonging to the twelfth century, may be singled out for their influence on subsequent English literature—an influence due to the fact that it was chiefly they who collected the large body of Arthurian romance, which has since been a common storehouse for English poets. These are Geoffrey Gaimar or Geoffrey of Troyes, author of a metrical version of Geoffrey of Monmouth's Latin Legendary History, with a continuation; Wace, author of another version of the same work, which

superseded Gaimar's; Walter Map, or Mapes, and Robert de Borron, to whom are due the best known forms of the Arthurian legends. This literature belongs more properly to French than to English literature.

We now come to English literature in the restricted sense of the term, that, namely, written in the language which has been spoken and written in England without experiencing any great and sudden modification from about the middle of the thirteenth century down to the present day. In this sketch Scottish as well as English writers will be included, as the language formerly spoken in Scotland is as much entitled, from its resemblance to modern English, to have the term English applied to it as the language spoken during the same period in England; and indeed, if we go back to the period of Chaucer and Barbour, we find that the language of the English Chaucer, when compared with modern English, presents even more points of difference than that of the Scottish Barbour. Before the beginning of the fourteenth century the only English writer that deserves mention in this brief sketch is perhaps Robert of Gloucester, and he only on account of his position, as his work, a metrical chronicle, which is nothing else than a free translation of Geoffrey of Monmouth's Latin History, possesses no literary merit. In Warton's judgment the fables often have a more poetical air in Monmouth's prose than in Robert of Gloucester's rhyme. In the next century we meet with the following important names—Robert or William Langland, belonging to the latter half of the fourteenth century; Sir John Mandevil (died 1372); John Barbour*; John Wycliffe (1324–84); John Gower (died 1408); and Geoffrey Chaucer (1328–1400). Langland is the author of the visions of Piers Plowman, written in alliterative verse. It is to this poem that one must turn if one wishes to see a true picture of the humbler classes in England during the time at which he writes. Mandevil was a great traveller, who recounted in prose all that he had seen and all that he had heard in the East. The work may still be read without difficulty, and it may be remarked generally that the prose of that period presents fewer difficulties to an ordinary English reader than the verse. Wycliffe, the only other celebrated prose writer of this age, was a voluminous writer, but is chiefly known as the translator of the whole Bible into English, probably the first complete English version. The greatest of all the writers of this period is of course Chaucer, who is universally acknowledged to be the greatest of English poets before Spenser, and is still allowed to hold a place in the first rank of British authors. As Langland was the poet of the humbler classes, Chaucer was the court poet of his day. We do indeed find in his Canterbury Tales distinct and graphic pictures of English society in nearly all its grades, but these pictures are drawn from the point of view of one in good station, not, as in the case of Langland, from that of one who lived among the humbler classes and shared their sympathies. The subject of Chaucer's great work is such as to afford him an opportunity of depicting the English life of his day in nearly every aspect. It describes a pilgrimage to Canterbury to the tomb of St. Thomas Becket made by a motley company who meet by chance at the Tabard Inn in Southwark, and agree to beguile the way to Canterbury and back by each telling a single tale on the journey to Canterbury and another on the journey back. The prologue to these tales, in which the company is described, is generally looked upon as the most interesting fragment of English literature before the Elizabethan era. This work of Chaucer's is unfortunately scarcely half finished.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the fourteenth to near the end of the sixteenth century, is a very barren one in English literature. It was a very unsettled period in England. The greater part of the fifteenth century was taken up with war, either foreign or domestic, the first half with the wars in France under Henry V. and Henry VI., and the latter half with the wars of the Roses; and the sixteenth century, embracing the Reformation era, was a time of great political and religious controversy. The consequence of this was that there was little leisure for the production of pure literature. The attention of the ablest men of the time was directed to other objects. Those who did not feel themselves very strongly drawn to any particular mode of life sought distinction in the manner in which it was most readily to be attained—in the fifteenth century in warfare, and in the next by taking part in the controversies then raging. Such literature as we have in England during this period is accordingly chiefly of a polemical nature, including satire, the form which poetry most naturally assumes in such an epoch. The only writers worth mentioning of this period belonging to the department of pure literature are Sir Thomas More (1480–1535), author of Utopia; the dramatist John Heywood (died about 1565); the poets Sir Thomas Wyatt (1503–42) and Henry Howard, earl of Surrey (born about 1516; beheaded by Henry VIII. in 1547); and the scholar Roger Ascham (died 1568). Heywood deserves mention merely as the writer of a kind of plays called 'interludes,' which form the transition between the old mysteries and moralities and the modern form of the drama. The Earl of Surrey is usually held to be entitled to the honour of having introduced blank verse into English, namely, in his translation of the second and fourth books of Virgil's Æneid, but this honour has also been claimed for Chaucer, whose two prose tales in the Canterbury Tales ought, it is said, to be printed in the form of blank verse, not prose. Against these three writers in the department of pure literature there might be placed a long list of authors whose works are of a polemical nature, religious, political, or both, but it is sufficient to mention the following: John Fisher, bishop of Rochester (1459–1535); Sir Thomas More, already mentioned in the department of pure literature; William Tyndale (about 1485–1536) and Miles Coverdale (about 1485 to about 1565), translators of the Scriptures; Hugh Latimer, bishop of Worcester (burned 1555); Nicholas Ridley, bishop of London (burned 1555), and Reginald Pole, cardinal and archbishop of Canterbury (1500–58). To these may be added the satirist John Skelton (about 1460–1529).

The period of which we are now speaking, in England the most barren in pure literature, is, on the contrary, one of the richest in Scotland. The Scottish writers include King James I. (murdered 1437), Blind Henry the Minstrel (flourished about 1460), William Dunbar (born about 1465; died about 1520), Gawin Douglas, bishop of Dunkeld (born about 1474; died 1522), translator of Virgil's Æneid, Sir David Lyndsay (about 1490 to about 1555), John Knox (1505–72), and George Buchanan (1506–82).

The next period, that which opens with Spenser, the most poetical of poets, is known as the Elizabethan age, and is the brightest in English literature —an age in which a greater number of intellects of the first order were clustered together in the ranks of literature than at any other period since the time of Pericles. Poetical literature is throughout pre-

* Scottish.

dominant, and it would fill nearly a column merely to enumerate the poets, all more or less distinguished, that flourished in this age. If the poets be separated from the dramatists, the greatest of them all is beyond all question Edmund Spenser (1552 or 1553–99), the author of the Faerie Queene; and the majority of the other poets may be classed as Spenserians or imitators of Spenser. Among these are the two personal friends of Spenser—Sir Walter Raleigh (1552–1618), an historian as well as a poet, and Sir Philip Sydney (1554–86), also both a poet and a prose writer; and in addition to these two Edward Fairfax (died about 1632), the translator of Tasso, Michael Drayton (1563–1631), Giles Fletcher (died 1623), Phineas Fletcher (about 1584 to about 1650), and William Drummond* of Hawthornden (1585–1649). During this period there also flourished a peculiar class of poets, by Johnson called metaphysical. These are scarcely entitled to the appellation of poets in the strictest sense of that term, being rather ingenious thinkers, who use verse as the medium of expression for thoughts more quaint and fantastic than could be suitably expressed in prose. Such are Sir John Davies (died 1626), author of the Immortality of the Soul; Dr. John Donne (1573–1631); Francis Quarles (1592–1644); and George Herbert (1593–1633). The last two show a preference for subjects of a religious nature. There are still two poets belonging to neither of the preceding classes that ought not to be omitted. These are the satirists Bishop Joseph Hall (1574–1656), to whom the epithet of the English Persius is sometimes attached; and George Wither (1588–1667). The former is also celebrated as an ecclesiastical writer, and the poetry of the latter is not entirely satirical. Most of the best extant ballads, both English and Scottish, also belong to this age, or perhaps one somewhat earlier, although the older form of Chevy Chase, the most famous of them all, is probably as old as the time of Henry VI. See CHEVY CHASE.

The Elizabethan age is also the golden age of the English drama. It includes among the dramatists William Shakspeare (1564–1616), whom it is almost superfluous to mention; as well as Christopher Marlowe (died 1593), author, among other pieces, of Dr. Faustus, to which Goethe was indebted, in no inconsiderable degree, in his drama on the same subject; Ben Jonson (1574–1637); John Fletcher (1576–1625) and Francis Beaumont (1586–1615); Philip Massinger (1584–1640); John Ford (1586 to about 1640); some of whom are of so high an order that they would be classed as minor dramatists only in the age which produced Shakspeare.

The list of great names belonging to this age is not exhausted until mention is made of Francis Bacon, Lord Verulam, Viscount St. Alban's (1561–1626), who is, on the one hand, still looked up to by at least one school of philosophers as in some sense the founder of modern philosophy, as having given to philosophy a new starting-point and a new method; and, on the other hand, claims more general admiration as a thinker and observer, and as a master of pithy and pregnant English. By scholars he is not less admired for the excellence of his Latinity. Although Bacon did indeed live in part during the reign of Elizabeth, and produce some of his works during that part of his life, yet as his greatest works were produced during the reign of James, it may be questioned whether he ought, strictly speaking, to be classed among the Elizabethan writers. Perhaps it is more correct to regard him as belonging, with several others of those mentioned above, to what has been called the 'afterglow of the Elizabethan age'—an epoch still bright in English literature, but in some degree eclipsed by the exceeding splendour of the one immediately preceding.

During a portion of the seventeenth century the production of pure literature was interrupted in a similar way to that in which it was interrupted between the time of Chaucer and that of Spenser, namely, by the unsettled state of the country, only in this case the interruption lasted for a much shorter time. The period referred to is that between 1640 and 1660, from the assembling of the Long Parliament to the Restoration, when pure literature was displaced by floods of controversial writing on religious and political subjects. Sir Thomas Browne (1605–82) was almost the only writer of note who continued during this period of civil strife and commotion to meditate in retirement and commit his meditations to paper undisturbed by what was going on around him. Some of the chief works of Hobbes (1588–1679) were, it is true, written during this period, but then they were written abroad. The rest of the seventeenth century is rich both in verse and in prose. In the latter respect it has been said to be deficient, but De Quincey avers, on the contrary, that in prose it 'produced the highest efforts of eloquence (philosophic, but at the same time rhetorical and impassioned) which our literature possesses. Donne, Chillingworth, Sir Thomas Browne, Jeremy Taylor, Milton, South, Barrow,' he adds, 'form a pleiad, a constellation of seven golden stars such as no literature can match in their own class.' Among the other prose writers of this century are Robert Burton (1576–1640), author of the Anatomy of Melancholy; Edward Hyde, Lord Clarendon, the historian (1608–74); Thomas Fuller (1608–61), the author of Church History, &c.; John Bunyan (1628–88), author of the Pilgrim's Progress; Anthony Wood (1632–95), the minute and careful historian of Oxford; and representing philosophy (in addition to Hobbes, already mentioned) there are the two so-called 'Cambridge Platonists,' Henry More (1614–87) and Ralph Cudworth (1617–88); and John Locke (1632–1704), the author of the Essay on the Human Understanding. The two greatest poets of the century are John Milton (1608–74) and John Dryden (1631–1700). Professor Masson has remarked that the career of Milton presents a curious illustration of the tendency there is in periods of great internal commotion in any country for great minds to be drawn off from pure literature. In his youth Milton was a poet; from 1640 to 1660 a prose polemical writer, and from 1660 to 1674 again a poet. Besides these two great poets there are other two who ought not to be passed over, Samuel Butler (1612–80), author of the Hudibras, a satire on the Puritans; and Abraham Cowley (1618–67), the most important of the so-called metaphysical poets since Donne.

The eighteenth century is one that is often pointed out as one of general declension, in England as well as elsewhere, and perhaps if we confine our attention to literature, the remark will not seem unfounded. A few of the leading writers in the several departments of literature may be mentioned. It will be noticed that Scottish and Irish writers now begin to take a prominent place in English literature. In the following lists Scottish writers are distinguished by *, Irish by †, American by ‡. In poetry and imaginative literature we have Daniel Defoe (about 1660–1731), novelist; Dr. Jonathan Swift† (1667–1745), satirist and novelist; Joseph Addison (1672–1719), imaginative prose writer and dramatist; Allan Ramsay* (1686–1758); John Gay (1688–1732); Alexander Pope (1688–1744); Samuel Richardson (1689–1761), novelist; Robert Blair* (1699–1746 or 1747); James Thomson* (1700–48); Henry Fielding (1707–54), novelist; Lawrence

* Scottish.

Sterne (1713–68), novelist; William Shenstone (1714–63); William Collins (1720–56); Tobias Smollett* (1721–71), novelist; Oliver Goldsmith† (1728–74), poet and novelist; William Cowper (1731–1800); Richard Brinsley Sheridan† (1751–1816), dramatist; Robert Fergusson* (1750–74); Thomas Chatterton (1752–70); George Crabbe (1754–1832); and Robert Burns* (1759–96). The chief historical writers are David Hume* (1711–76); William Robertson* (1721 or 1722–91); and Edward Gibbon (1737–94); along with whom may be classed James Boswell* (1740–95), the biographer of Johnson. The chief philosophical and expository writers include Sir Richard Steele† (about 1670–1729), essayist; Bernard de Mandeville (about 1670–1733); Joseph Addison, essayist; George Berkeley†, bishop of Cloyne (1684–1753), the idealist philosopher; Joseph Butler (1692–1752); Jonathan Edwards‡ (1703–58), theologian; David Hartley (1705–57); Dr. Samuel Johnson (1709–84); Dr. Thomas Reid* (1710–96); David Hume*; Adam Smith* (1723–90); Edmund Burke† (about 1730–97); Jeremy Bentham (1749–1832); and Dugald Stewart* (1753–1828). Finally, in the department of scholarship the chief are Richard Bentley (1662–1742); Sir William Jones (1746–94); and Richard Porson (1759–1808).

In the nineteenth century a considerable proportion of American authors must also be included among the producers of English literature. Following the same classification for this century we have among the poets and imaginative writers Samuel Rogers (1763–1855); Maria Edgeworth (1767–1849), novelist; William Wordsworth (1770–1850); Sir Walter Scott* (1771–1832), poet and novelist; Samuel Taylor Coleridge (1772–1834); James Hogg* (1772–1835), the Ettrick Shepherd; Robert Southey (1774–1843), poet and miscellaneous writer; Charles Lamb (1775–1834), essayist; Walter Savage Landor (1775–1864); Thomas Campbell* (1777–1844); Thomas Moore† (1779 or 1780–1852); Washington Irving‡ (1783–1859), novelist, &c.; Henry Kirke White (1785–1806); Lord Byron (1788–1824); J. F. Cooper‡ (1789–1851), novelist; Percy Bysshe Shelley (1792–1822); Mrs. Hemans (1794–1835); John Keats (1796–1821); William Cullen Bryant‡ (born 1797); Thomas Hood (1798–1845); Nathaniel Hawthorne‡ (1804–64), novelist; Lord Lytton (1805–73), poet and novelist; Benjamin Disraeli (born 1805), novelist; Henry Wadsworth Longfellow‡ (born 1807); O. W. Holmes‡ (born 1809), poet and novelist; Alfred Tennyson (born 1810); Edgar Allan Poe‡ (1811–49); William Makepeace Thackeray (1811–63), novelist; Charles Dickens (1812–70), novelist; Robert Browning (born 1812); Harriet E. B. Stowe‡ (born 1812), novelist; William Edmonstoune Aytoun* (1813–65), poet and writer of tales; James Russell Lowell‡ (born 1819), poet and miscellaneous writer; Charlotte Brontë (1816–55), novelist; and Mary Anne Evans, better known under the pseudonym of George Eliot (born 1820), novelist. Among the historians are Dr. John Lingard (1771–1851); James Mill* (1773–1836); Henry Hallam (1777–1859); Henry Hart Milman (1791–1868); Sir Archibald Alison (1792–1867); George Grote (1794–1871); Thomas Carlyle* (born 1795); William Hickling Prescott‡ (1796–1859); Connop Thirlwall (born 1797); Lord Macaulay (1800–59); George Bancroft‡ (born 1800); Alexander William Kinglake (born 1802); John Hill Burton* (born 1809); John Lothrop Motley‡ (born 1814); Sir Arthur Helps (born about 1817); E. A. Freeman; James Anthony Froude (born 1818); and Thomas Henry Buckle (1822–62). Among the philosophical and expository writers are Sir James Mackintosh (1765–1832); Rev. T. R. Malthus (1766–1834), political economist; John Foster (1770–1843), theologian and critic; Rev. Sydney Smith (1771–1845), essayist and critic; S. T. Coleridge; Francis Jeffrey* (1773–1850), critic; James Mill*; William Hazlitt (1778–1830), critic; Dr. Thomas Brown* (1778–1820); Lord Brougham* (1779–1868); Dr. Thomas Chalmers* (1780–1847); Sir David Brewster* (1781–1868), scientific writer; Thomas De Quincey (1785–1859), essayist and critic; Richard Whately (1787–1863); Sir William Hamilton* (1788–1856), philosopher; Sir John Herschel (1790–1871), scientific writer; Sir Roderick Impey Murchison* (1792–1871), scientific writer; Hugh Miller* (1802–56), scientific writer; Ralph Waldo Emerson‡ (born about 1803), essayist and miscellaneous writer; John Stuart Mill (1806–73), philosopher; James David Forbes* (1809–68), scientific writer; Charles Robert Darwin (born 1809), scientific writer; John Ruskin (born 1819), writer on art; Herbert Spencer (born 1820); John Tyndall (born about 1820); Thomas Henry Huxley (born 1825), scientific writer. In the department of scholarship there are Sir Henry Rawlinson (born 1810); John William Donaldson (1811–61); John Conington (1825–69); and H. A. J. Munro. Finally, a few of those who have written works of travel may be mentioned, such as David Livingstone* (born 1815); Richard Francis Burton (born 1821); Sir Samuel White Baker (born 1821); and John Hanning Speke (1827–64).

The present sketch of the history of English literature would be incomplete unless some notice were taken of the chief periodical literature published in the English language. In the following list the most important reviews and magazines are mentioned; an account of the chief newspapers will be found in the article NEWSPAPERS. Those now extinct are distinguished by an asterisk prefixed to their names, and those published in America are distinguished by a dagger. The Gentleman's Magazine (first published at the end of 1731); the Monthly Review* (begun in 1749, discontinued in 1845); the Critical Review* (begun January, 1756, discontinued June, 1817); the Philosophical Magazine (begun in 1798); the Edinburgh Review (begun in 1802); Quarterly Review (begun in 1809); the North American Review† (begun in 1815); Blackwood's Magazine (begun in 1817); the Retrospective Review* (begun November, 1820, discontinued August, 1828); the Westminster Review (begun in 1824); the Foreign Quarterly Review* (begun in 1827, incorporated with the Westminster in 1846); the Athenæum, a weekly critical journal (begun in 1828); Fraser's Magazine (begun 1830); Reports of the British Association since 1831; Journal of the Royal Asiatic Society since 1834; Punch (begun 1841); North British Review* (begun 1844, discontinued February, 1871); Association Medical Journal (begun January, 1853, title changed to British Medical Journal January, 1857); the Atlantic Monthly† (begun 1857); Fine Arts' Quarterly Review (begun 1863); Fortnightly Review (begun 1865); the Academy, a fortnightly critical journal (begun in 1869); British and Foreign Evangelical Review; Contemporary Review; Theological Review; Eclectic Review; Home and Foreign Review; Cornhill Magazine; Macmillan's Magazine; Tait's Magazine*; London Magazine*; Dublin University Magazine; &c. &c. &c. Notices of a few of the above are given under the proper headings.

The manufactures and commerce of England, which form such important features of the country, have already been treated of in the article BRITAIN, to which the reader is referred. See also the articles COTTON, LINEN, IRON, WOOL, &c.

An account of the government and constitution of

England will be found in the article BRITAIN, section British Constitution.

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ENGLAND, NEW. See NEW ENGLAND.

ENGLISH CHANNEL, the sea which separates England from France, extending, on the English side, from Dover to the Land's End; and on the French, from Calais to the Island of Ushant. On the east it communicates with the German Ocean by the Strait of Dover, 21 miles wide; and on the west it opens into the Atlantic by an entrance about 100 miles wide. At its greatest breadth it is about 150 miles. On the English side, off the coast of Hampshire, lies the beautiful Isle of Wight; while Guernsey, Jersey, and the other Channel Islands are situated off the French coast. The pilchard, and mackerel, and oyster fisheries in the Channel are very important.

ENGRAVING, in the primitive sense of the term, denotes the art of representing objects and depicting characters on metal, wood, precious stones, &c., by means of incisions made with instruments variously adapted to the substances operated upon, and the description of work executed. The different inventions, however, which superseded graving or incising, led to the word being used in a wider sense; and though yet strictly applicable, in its original meaning, to seal or gem engraving, to die-cutting, and wood engraving, it now comprehends all works of art executed on plates intended for printing, by whatever means they are produced. Impressions from metal plates are named engravings, prints, or plates; those printed from wood being called indifferently wood engravings and wood-cuts.

Abundant evidence that engraving was cultivated in some of its higher forms at very remote periods is presented to us in the clear allusions to the art found in the most ancient writings, sacred and profane, and also in the relics collected from time to time, and deposited in almost every museum in Europe. The reference in the book of Exodus to the engraving on the precious stones and plate of gold adorning the breastplate, ephod, and 'holy crown' of Aaron the high-priest, and Homer's enumeration of the objects represented on the shield of Achilles, are familiar written proofs of its great antiquity. The discoveries among the ruins of ancient Egypt, of Greece and Etruria, the later excavations in Herculaneum and Pompeii, and, still more recently, in the long-buried ruins of Nineveh and Babylon, place before us the works of the old-world engravers, each impressed with a style of design and execution peculiar to the country and age which produced them.

An historical notice, comprehending all branches of the art, however slightly treated, would exceed our limits; but the great development of wood engraving and plate engraving, and the important educational purposes they now subserve, calls for a brief inquiry into their rise and progress.

Engraving on wood, intended for printing or impressing from, long preceded copperplate engraving. It has also the honour of having suggested the grand discovery of printing with movable types. The art is of eastern origin, and we learn from undoubted authority that so early as the tenth century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans in the thirteenth century, their manner of operating closely resembling that practised in China.

Papillon, the French historian of the art, gives the names of Alessandro Cunio, and his twin sister Isabella, Venetians of noble family, who lived in the latter half of the thirteenth century, as the earliest known designers and engravers on wood.

No records are found of engraving being practised during the next 150 years; but following this period, and down to the seventeenth century, Italy, Germany, France, and Holland produced many artists who successfully cultivated the art. It is to Germany, however, we are indebted for the choicest specimens of early wood engraving; and among these the works of Albert Durer stand pre-eminent for delicate yet spirited execution. Towards the end of the seventeenth century copperplate engraving began to supersede engraving on wood in many of the uses to which the latter had been applied. From that time few wood engravers of any note appeared, until the increasing demand for illustrated works about the close of the last century caused a revival of the neglected art, which has since continued to expand and so develop its resources that its productions, now scattered abroad in boundless profusion, are brought within reach of all, enriching alike the costly volume and humble periodical.

The first English engravers on wood worthy of notice are Edward Kirkall, born in 1695, and John Baptist Jackson, who died in 1754. But the art had no real vitality in England until the brothers Bewick, about the close of last century, founded the English school of wood-engraving, which has since attained a position second to no other—the works of many eminent English engravers taking rank among the finest specimens of the art.

Copperplate engraving arose in the fifteenth century. Until then the art of engraving on metal had been confined to decorating sacred vessels, armour, services of plate, &c., with emblematic figures, and other pictorial and ornamental devices. A very ancient practice was to fill the engraved lines of these ornaments with different coloured metals, and similar to this inlaying was the 'working in niello' extensively practised throughout Europe in the fourteenth and fifteenth centuries, which consisted in filling the engraved lines with a dark metallic enamel, composed of silver, lead, copper, sulphur, and borax.[1] The engravers, who were also the fabricators of the articles they thus decorated, generally secured duplicates of their works before laying in the niello, by filling the lines with dark colour, and taking casts of them in sulphur. Ultimately this practice suggested the practicability of taking impressions upon paper, a discovery which led to engraving upon copper plates solely for the purpose of printing from.

Although the prior discovery has been claimed for German artists, it is now generally agreed that the practice was first established by the Florentine goldsmith and engraver Finiguerra, an impression from one of his works having been recognized as produced

[1] This compound was reduced to a powder, fusible at a heat much lower than is required to melt silver. The method of filling in the lines was by spreading the niello over the engraved surface, and heating the plate till the powder melted and ran into the lines. When the metal cooled the superfluous niello was scraped off, and the surface burnished, the full effect of the design being thus brought vividly out by the contrast of the dark lines with the light metal.

in 1440, the date of the earliest German print being 1460. The new art had, however, very soon spread over Italy and Germany, for before the close of the century many eminent engravers had risen in both countries. Among Italian artists of the period the highest place is assigned to Marc Antonio Raimondi, who, under the superintendence of Raffaelle, engraved many compositions of that prince of painters. In the early German school we again find the genius of Albert Durer directed to engraving on copper with a success equal to that in his wood-engraving. Though the Italian works excelled in grace of outline and beauty of expression, it is still to Germany we must look for the most finished execution in early copperplate engraving. Towards the end of the fifteenth and during the first half of the sixteenth century many Dutch and Flemish, and a few French artists, attract attention by the merit of their works; but the period most prolific in able engravers of the early schools was between 1550 and 1640, when a host of Italian, German, Dutch, Flemish, and French engravers arose, whose works are still highly prized.

For a considerable time after the introduction of the art nothing higher was aimed at than an imitation of pen-and-ink drawing. Raimondi, and especially Durer, made great advances beyond this; but it was reserved for the Dutch engraver Cornelius Cort, about the end of the sixteenth century, to introduce a higher style, in which a broader and more forcible treatment of light and shade, and a bolder and freer execution were adopted.

Although etching was practised at an early period of the art by Albert Durer and others, its combination with graver work was rarely, and very partially, had recourse to until the end of the seventeenth century. Prior to that time the graver was almost exclusively employed in the finest works, and little more than a century has elapsed since the successful union of the two methods supplied what had been wanting to make the art a full and faithful reflex of painting.[1] It is to be remarked, however, that though dry and poor in style, the plates of the early engravers generally exhibit a vigorous accuracy of drawing, and a dignified grace of expression not surpassed in the best prints of later times, many of these fathers of the art having been eminent as painters; and the works of the least conspicuous among them show a knowledge of the higher principles of art less frequently met with in the more elaborate modern plates.

A perceptible change in style about the end of the seventeenth century marks the rise of the modern continental schools of engraving. Since then the artists of France, Italy, and Germany, have rivalled each other in producing many noble specimens of their skill and industry. Among those masters whose works elevated the art and formed the style in their several countries, the names of Wille in France, Morghen in Italy, and Müller in Germany, may be cited as the most prominent.

Britain possesses no early engravers in the simple style worthy to rank with the continental masters; and it was not until the middle of the seventeenth century that a few English and naturalized foreign artists, by their successful cultivation of the compound process, gave an impulse to the art, which had hitherto languished in complacent mediocrity. The succeeding century produced many native engravers who contributed to raise the British school to high eminence. The most celebrated of these, Sir Robert Strange and William Woolet, may be regarded as the founders in Britain of the styles in which they respectively excelled. The plates of Strange and Woolet compare advantageously with the best preceding and contemporary works of the Continent, and are still unsurpassed in many essential qualities. The style adopted by these eminent masters has been followed, and in some respects improved upon by their successors; its character is distinguished by great freedom, boldness, and variety of lines, and a certain studied looseness in their disposition. Modern British engravers have given more attention to varied texture and tone than their continental rivals, the result being a peculiar richness and feeling of colour never before so perfectly obtained in engraving.

The preceding sketch of copperplate engraving refers chiefly to engraving in lines, and it remains shortly to notice other methods invented at later periods with the view of lessening the labour while producing effects unattainable by the established process. These may be separated into three divisions—Stipple, Mezzotinto, and Aquatinta. Modifications of each have from time to time engaged the attention of engravers and others, but are now seldom practised; Mezzotinto alone having taken a very effective form under the name of the Mixed style, extensively employed in large works.

The Stipple manner only assumed the position of a fixed style about the middle of last century. A few French, Dutch, and English engravers adapted it with some success to the imitation of chalk drawings—hence the name *chalk style*—but it is in Britain alone that full advantage has been taken of its peculiar resources. Bartolozzi established the method in England, and it has since been practised with signal success by many native artists.

The invention of Mezzotinto has been ascribed to the cavalier general, Prince Rupert. Later authority, however, assigns the honour to a German soldier, Col. von Seigen, from whom, it is alleged, Prince Rupert borrowed his knowledge of the process. A number of engravers in Holland, Germany, and England, soon adopted the new style, but it does not seem to have found favour with the Italian and French artists of the period. Subsequently the engravers of France made considerable progress in mezzotinto, but it may be safely affirmed that its finest examples have been executed by British artists. Since about the year 1830 it has gradually merged into the mixed style, and purely mezzotinto plates are now rarely produced.

Aquatinta is the latest of these inventions, and its author seems to have been the Abbé de St. Non, a French litterateur and amateur engraver, who flourished in Paris about the middle of last century. This manner is best suited to prints intended for colouring; and fair imitations of water-colour drawings may be produced by adapting the process to printing in colours. Like mezzotinto, it has generally fallen into disuse as a distinct branch of engraving.

Until about the year 1820 copperplates were always used for engraving upon; but about this period the growing necessity for large numbers of good impressions being printed from one plate led to the use of steel as a substitute.[2] Within a very few years the superiority of steel, both as allowing tenfold the

[1] In the early times of the art, and generally down to the period stated above, the outline was transferred to a thin coating of bees'-wax spread over the plate, and, being gone over with the point and lightly scratched into the copper, the wax was cleaned off, and the subject laid in with lines and finished entirely with the graver.

[2] The introduction of steel is generally admitted to be owing to Mr. Perkins, an American gentleman, whose discovery included an ingenious method of transferring, by a simple mechanical process, the engraving from the plate after hardening it, to a soft steel roller, which, hardened in turn, is used to re-transfer the work to an indefinite number of softened steel plates. This practice, beset with difficulties in the hardening process, obtains largely in America.

number of good impressions, and as admitting higher finish, caused it to be used exclusively for all fine works of limited size; but the early difficulties of working it having been conquered, steel has, for many years, been used in works of the largest dimensions. The introduction of steel gave a great impetus to the art, and in no period of its history has it been so widely diffused, or so many works of the highest class produced.

In proceeding to describe the methods and the instruments employed in the different styles, we give precedence to Line-engraving, not only on account of its demanding greater manipulative skill, and that in it the highest triumphs of the art have been achieved, but also because a description of the tools and many of the processes will include those used in most of the other branches.

Line-engraving, as implied by the term, is executed entirely in lines. The tools are few and simple. They consist of the graver or *burin*, the point, the scraper, and the burnisher; an oil-stone or hone, dividers, a parallel square, a magnifying lens, and a blind, or shade of tissue paper, to make the light fall equally on the plate. For levelling important erasures there are used callipers, a small steel anvil, a small pointed hammer, and punches. The *graver* is a small quadrangular bar of finely-tempered steel, curved slightly upwards; it varies in shape from a perfect square to an acute lozenge; the cutting end, or face, is ground with a backward slope, while the belly, or undermost and cutting angle, is whetted to a smooth but not very keen edge. It is fixed in a short pear-shaped handle of hard wood, the under side being made flat to allow the graver to lie nearly parallel with the plate when used. The rounded end leans against, and is pushed forward by the back part of the palm of the hand, while the smaller end, and the graver itself, are grasped and guided by the thumb and all the fingers, which rest on each side, but must not extend below or round the instrument. The *point* is a cylindrical piece of fine steel, a little thicker than a stout darning-needle, inserted in a wooden handle about 5 inches long. It is used in the manner of a pen or pencil. The *scraper* is a triangular steel instrument, about 3 inches long and a quarter of an inch broad, tapering to a point. It is used to scrape off the *burr* cast up on the sides of the cut lines, and to make erasures. The *burnisher* is made of very hard steel, finely polished, elliptical in shape, and pointed. Its use is to burnish the plate and to make small erasures; but it is also an important auxiliary in finishing and giving tone to the work. In etching, the following articles are required:—a resinous mixture called etching ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a hand-vice; some hair pencils of different sizes, and bordering wax, made of burgundy-pitch, bees'-wax, and a little oil. *Common etching ground*, which is that most generally used, is composed of three parts asphaltum, two parts burgundy-pitch, and one and a half part virgin wax. These are carefully melted in an earthen pipkin, and when thoroughly incorporated, the mixture is poured into water and kneaded into small balls, which are tied separately up in stout silk when used. The *dauber* is made by tying up lambs' wool in fine muslin with a circular piece of card-board about 3 inches in diameter on one side, thus forming a pad, flat behind, rounded on the face, and about 1 inch thick. This is covered with well washed, stout, used silk, pulled tightly over the rounded face, and secured behind with thread.

On commencing a plate, the first procedure of the engraver is to make a careful outline of his subject upon thin paper, with a black-lead pencil. If a painting is to be copied, or a drawing that is larger than the intended plate, the following method is taken to insure perfect accuracy in the reducing:—The picture is overlaid with two rows of fine white threads, drawn tightly across its face, crossing each other at right angles, and at regular distances marked by the dividers; thus forming a series of perfect squares all over it. An exactly similar number of squares corresponding with the size of the intended plate are then drawn on paper with faint colour, or by a blunted point. The squares on the picture and on the paper are numbered alike, and it is then a comparatively easy task for a skilful draughtsman to transfer to each square on the paper a minutely accurate outline of the objects contained within the corresponding squares on the picture. Should the original be a drawing or a print the same size as the intended engraving, the outline may be traced through on transparent paper, but it must be revised and perfected after tracing. The next step is to lay the *ground* on the plate; and an essential preliminary is to thoroughly cleanse its surface. Copper is effectually cleaned by a mixture of fine whiting and turpentine spread over the heated plate, and when the turpentine evaporates, wiping off the whiting with clean rag. The most efficient means of cleaning a steel plate is a strong ley, or solution of the common black ashes of the shops, and turpentine. With this mixture the plate is repeatedly washed, and each time rinsed with cold water; finally, it is rubbed dry with a scrupulously clean cotton rag. The hand-vice is now attached to one corner of the plate, a small thick fold of paper protecting the face at that part; then the plate is laid face upwards on a moderately hot iron; or, better still, a tin box filled with water, kept boiling by a charcoal stove, or spirit-lamp beneath. By this latter contrivance all risk of burning the ground, and thus making it unfit for etching, is avoided. When the plate is hot enough, the ball of etching ground is rubbed over the surface, the heat causing it to melt and ooze through its wrapper of silk. The ground is then spread by light and rapid strokes with the rounded face of the dauber, continued until every part is thoroughly covered with an equal thin coating. The ground must now be smoked while the plate is hot, by holding it face downwards, and passing the flame of two or three wax tapers loosely tied together, rapidly to and fro and across its surface, till it becomes a clear shining black; but care must be taken not to burn it, by permitting the flame to rest an instant on one place. The plate being cooled the paper on which the outline is drawn is damped, placed carefully face downwards on the plate, and secured in its position by small bits of bordering wax; another piece of paper, also damped, is next laid over it, and the whole passed through the roller-press used for printing plates. When the paper is lifted off, the pencil outline is found transferred in *reverse* to the shining black surface in clear silvery lines.

Etching[1] now follows: and to protect the outline and ground during the process, supports made of paper, wood, or leather, about one-eighth of an inch thick, are fixed on the margin; resting on these the parallel

[1] The word 'etching,' taken in the sense of the German *ätzen*, from which it is derived, merely signifies corrosion; but its meaning, as now applied by engravers, refers only to drawing with the point, through the ground, the lines forming the shading. Corrosion, the second part of the process, is called *biting-in*. Thus, it is said that a plate 'is etched, but not yet bitten,' or, 'it is both etched and bit.' The great superiority of modern landscape plates over those of the early schools, is owing to the bold freedom of handling which etching permits.

square is laid across the plate for the twofold purpose of supporting the hand and of guiding the Point. In a landscape, outlining and etching in the parts go on simultaneously; but in an historical piece the outline must first be secured by dotting it in carefully with the point, and then all parts of the subject it is desirable to etch are proceeded with. In etching landscape upon copper the more delicate light parts of the shading are left to be put in afterwards with *dry point*—that is, by lines cut into the bare metal with the point alone; but on steel, all parts except the highest lights are etched and *bit*. The lines in a landscape plate are diversified according to the nature of the objects represented. The atmospheric effect of the sky, and extreme distance, is produced by straight or waved parallel lines laid close together; the middle distance is treated in a nearly similar manner, but the lines are wider apart, rougher, and not so uniformly parallel. Foliage is represented by short quick curves and angular forms, almost infinite in variety; grassy surfaces by similar lines, but more continuous and parallel; rough ground, rocks, and ruins, by a mixture of curved and angular lines, parallel, involved, and broken, according to the character of the object; architecture by waved or straight parallel lines; water at rest, by lines straight, horizontal, and parallel; and water in motion by waved and curved lines.

In an historical plate, the landscape and other accessories are treated with lines similar to, but generally more formally disposed than in a purely landscape plate.

In etching skies, distance, buildings, water, interior walls and furniture, drapery, &c., in which the lines, straight, waved, or curved, are parallel or nearly so, the point is leaned against, and moved along the edge of the square; but in all other cases the square is merely a rest for the hand, the point being used freely like a pen or pencil. None of the etched lines or dots are properly cut into the plate; the pressure should be merely enough to penetrate the *skin* of the metal, insuring the entire removal of the ground, so that the subsequent action of the acid may be quite unobstructed. Should any error occur in etching, a little of the ground, thinned with turpentine, is laid over the part with a hair pencil, and when dry it is re-etched.

Biting-in.—When the etching is completed the supports are taken off, and the *bridge*—a thin board, having cross pieces about one inch thick under each end—is laid across the plate to support the hand. The margins are then painted over with a varnish of brunswick black thinned with turpentine, the entire surface of the ground carefully examined, and all breaks or scratches pencilled over with the varnish which resists acid equally with the ground. When this hardens, a wall of bordering wax about an inch high is placed round the subject, and pressed firmly down on the plate to retain the acid which is now applied. It must be borne in mind that the spaces between the lines, however narrow, and all parts not touched with the point, are protected from the action of the acid by the ground. Nitrous acid mixed with three or four parts water and a little sal-ammoniac is used to corrode copper. When poured on, small bubbles of fixed air rise out of, and collect upon the lines; these must be continually brushed off with a soft feather, otherwise foul or irregular biting ensues. A quarter of an hour generally suffices to corrode the lightest parts to a sufficient depth and breadth. The acid is then poured off, the surface of the plate washed with clean cold water, and gently dried with blotting paper, or by the wind of a pair of bellows. A small piece of the ground is now scraped off the light parts to ascertain if they are the desired strength; if found to be so they are stopped-out—that is, covered with the varnish. When this dries the acid is again poured on, and remains till the next degree of strength is got; this process is repeated till all the successive degrees of dark are obtained. A little oil is now poured on to neutralize any remains of acid, the bordering wax taken off by a gentle heat, the plate washed with turpentine, and cleaned with rag and oil. The process of biting steel is similar to that described above, but a different acid is employed, and more care exercised on account of the rapid action of the acid. The mixture generally used is one part nitric acid to three or four parts strong acetic acid. This acts very quickly on steel, a second being sufficient for the lightest, and a few minutes for the darkest parts.

The biting-in being accomplished, a proof[1] is got preparatory to the next step towards completion. In a landscape the prelude to this is generally to lay in the sky, if not etched with the rest of the subject; a second ground, outline, and biting-in being necessary. The other parts of the landscape are now gone over with the graver, broken lines are led into each other, and the forms of objects more defined. The artist then proceeds to give the gradations of shading and strong darks which cannot be got by a first biting. This, which was formerly the work of the graver alone, is now done with a tithe of the labour by *re-biting*, an invention said to be purely English, and dating only from about 1760. For this process the plate must be cleaned with extra care, and the lines cleared out with crumb of stale bread. The ground is melted only on the margins of the plate; it is taken up gradually with the dauber, and conveyed to the parts to be rebitten by very light and rapid strokes, till all the spaces between the lines are perfectly covered; but not a particle of the ground must enter the lines. Varnishing, biting, &c., are precisely the same as before. The finishing is now proceeded with by crossing the sky with new lines overlaying the first at different angles, the light edges of clouds being softened and finished with dry point lines. Parts of the distance are similarly treated, and then the middle distance and foreground are again and more perfectly gone over with the graver, and occasionally rebitten. Finally, the burnisher is brought into play alternately with the graver and point, to give the last finish to all parts.

It now remains to notice the laying in and finishing an historical subject, a matter involving more studied and laboriously careful execution than is required in landscape. The accessories are partly finished; next follows laying in with the graver, in lightly cut lines, the drapery, flesh, and all other parts not etched. The direction, character, degrees of width, and disposition of these lines demand careful study, as it is to their judicious variety and correct adaptation to form and texture that a line engraving owes the peculiar richness and power which constitutes its superiority over all other styles. In draperies the lines are generally disposed across the folds diagonally, and in curves accommodated to their risings and fallings; the *modelling* of the forms being indicated by the greater width of the lines on the heights, and by closer contact and inversion of the curves in the depressions. In graving these lines regard must be had to the nature of the materials to be represented, although the various textures are only fully developed in finishing. In a well-fin-

[1] Proofs, in the etched state, of plates executed by engravers of high repute are much prized by connoisseurs; but the proofs thus sought after are rarely taken in the crude condition of the first biting-in; they are more commonly proofs of a slightly advanced state, in which some rebiting, and a limited use of the graver and point, have been employed.

ished modern historical plate nearly every substance has its own special character or disposition of lines. Rough woollen surfaces are represented by strong, long dot lines; smooth woollen draperies by continuous lines; velvet, silk, satin, and metallic surfaces have lines similar in character, though varied in disposition and treatment; they are generally laid wide apart to receive an interline in finishing. To realize the texture and tones of the human skin or flesh is the most difficult task of the engraver. This is best done by lines formed of long dots closely following each other in the dark parts, the distance between the dots increasing as the high lights are approached. Continuous cut lines give a metallic texture to flesh.

When all parts of the subject are laid in, the artist proceeds to finish the work by re-entering and thickening with the graver the lines forming the darker shadows of the drapery, and by cutting cross lines over those parts where the forms of the folds, the texture, or colour, render crossing desirable; the strength of the lines being occasionally helped by re-bitings. Cross lines should be laid over the first at such an angle as will make the spaces thus formed assume a blunt lozenge shape, and these spaces are filled, as occasion requires, with long or round dots. Velvets, satins, silks, and metals are generally brought up to their full strength of shading by laboriously patient cutting, to secure the necessary equality and smoothness. Flesh is finished by crossing, where needful, with dotted lines; the dots forming the crossings being confined to the spaces between the principal lines. The lines of dots are generally run through lightly with the graver in the shadows, to give them a softened continuity, but in the light parts they are connected by small irregular dots, while the middle of the spaces formed by the crossings are filled with similar dots.

In Pl. LIV. fig. 1 is an example of a figure in the etched state, showing, when compared with the finished state in fig. 2, the relative amount of work in both, as generally practised in large plates.

An almost incredible amount of laborious and carefully minute graving is required in a highly-finished historical plate to bring out the proper effects of form, texture, relief, &c.: it is finished chiefly with the graver, burnishing and re-biting being much less available than in landscape. The concluding operation, in both landscape and historical plates, is termed *toning the plate*, which consists in a harmonious blending of the light and shade, by producing the half lights, reflections, and almost insensible gradations of tone, that are found not only in the shading, but in the different tints and colours of a picture, and which, though almost imperceptible to the unpractised eye, give the unity, breadth, and mellowness of effect essential to a highly-finished engraving; but many proofs and retouchings are necessary ere a satisfactory result is obtained.

Painters' or Amateur Etching.—This art is a favourite pursuit with amateurs; and as the formal regularity demanded in professional engraving is unnecessary, any one possessing a mastery of the pen or pencil in drawing can, with a little practice, attain considerable proficiency in it. Laying the ground and biting-in are done as previously described; but as the aid of the roller press cannot always be obtained, recourse may be had to another mode of transferring the outline. Rub over one side of a thin piece of paper with powdered red chalk, place the coloured side next the ground, and fasten the corners to the plate with bordering wax. The outline, made on tracing paper, is laid over all, face downwards; the pencilling seen through on the back is gone softly over with the point, and the subject thus reversed on the plate. Very little practice in the use of the graver and dry point suffices for finishing this description of work. A specimen of the style is given in fig. 3, Pl. LIV.

Soft-ground Etching.—This is the most expeditious of all methods of engraving; the manipulation differs but little from drawing in pencil or chalk. The ground, made by mixing lard with common etching ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then damped, and laid gently over the ground face upwards, and the margins folded over, and pasted down on the back of the plate. When the paper is dry and tightly stretched, the bridge is laid across, and with a hardish pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back of the paper at all parts touched by the pencil, and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk-drawing. The biting-in is effected in the same manner as already described, and the subject is finished by re-biting and dotting with the graver. A slight example of soft-ground etching will be found in Pl. LIV. fig. 4.

Engraving in Outline.—Outline is now invariably etched, but formerly the practice was to transfer it to a wax ground, and cut it entirely with the graver. The necessary relief is given by thickening the line on the shadow sides, but to preserve softness the thickening should consist of two or three lines laid close together. A further degree of roundness and form may be obtained by introducing a few light lines of shading; fig. 7, Pl. LIV., is a specimen of the manner.

Stipple, or Chalk Engraving, in its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands. Until the beginning of the present century this purity of style was generally preserved; but the mixture of lines then first admitted in back-grounds gradually extended to draperies and other parts in increasing proportions, and—excluding representations of statuary—few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. In addition to the instruments used in line-engraving, small toothed wheels, named *roulettes*, are used for etching imitations of chalk-hatching.

The first steps in executing a plate in this style are precisely the same as in line engraving, the accessories and landscape parts being etched with lines. Draperies that are to be treated in pure stipple, and parts of the flesh, are sometimes etched with dots, a graver having a downward curve being now used as well as the point; but in the best works draperies and flesh are left entirely for the graver. When the etching is bit in and the ground removed, the line parts are forwarded, and then the draperies, &c., to be treated in mixed line and stipple, are laid in with the graver in lines, similarly disposed but with less variety of character than in line engraving. Dotting is next introduced between these lines with the graver, and then the flesh and other purely stipple parts not etched, are also dotted in and the whole gently re-bitten. The gradations of shading in the flesh and stippled parts are now produced by enlarging the dots with the graver, and making the irregularities of their forms fit into each other, and again giving a general re-bite. This process is repeated until the whole subject is brought to nearly the full strength, after

which the stippled parts receive a light interdotting to give solidity to the tones. The final process of toning is the same as in line engraving; but as rebiting and burnishing can be more effectively resorted to, high finish is obtained with less labour. Examining a stipple plate closely, the dots are found to be composed of several incisions, slightly apart in the lighter shades, and run together into large irregular shapes in the strong darks. A great advance has been made in stipple engraving by the introduction of large and novel forms of dotting in the draperies. By this means an effect is produced rivalling line in richness and power. Fig. 8, Pl. LIV., is an example of pure stipple.

Aquatinta.—This method, as first practised and still followed on the Continent, has been already described (see AQUATINTA, vol. i. p. 217)—and it now only remains to notice the manner adopted by British artists.

Instead of depositing powdered resin and granulating it by the application of heat, an alcoholic solution of resin or mastic, in proportions of about one ounce of resin to a pint of alcohol, is used to form the ground. The outline of the subject is usually first etched, then the plate is cleansed, and laid in a slanting position in a shallow tin vessel. The solution is poured on the plate, its position being maintained till the superfluous fluid has nearly run off, when it is laid flat till what remains on the surface has settled and dried. The evaporation of the alcohol leaves the resin disposed equally over the plate in larger or smaller granulations according to the quantity of resin in the solution. The same acids are used in biting aquatinta. All the gradations of shading are sometimes got by one biting, but the ordinary practice is to use a second, or even a third ground of coarser quality for the darker shades. The *bursting-ground*, mentioned in the previous notice, can be as effectively employed in this as in the dust-ground manner. Aquatinta grounds are so hard that the outline may be traced on them without injury, and etching avoided; but the aid of lines cannot wholly be dispensed with. A specimen of aquatinta is given in Pl. LIV. fig. 5.

Mezzotinto differs fundamentally from all other styles of engraving on copper or steel, inasmuch as in it the lights and gradations are scraped and burnished out of a prepared dark ground, whereas in other methods the shading is corroded or cut into a blank surface. The instruments used are—grounding cradles, scrapers, and burnishers of different forms. The *cradle* is axe-shaped, from 1 to 3 inches wide, fitted into a thick upright handle, one side of the blade having a row of close fine points on its curved edge. With the largest size of these instruments the first and peculiar part of the process, termed *grounding the plate*, is effected. This consists in covering its surface with minute incisions, by rocking the tool across it in all directions.[1] It is obvious that a plate so treated would, if printed, give a uniform black impression, and that scraping any part would cause a lighter shade; further, that were the same part burnished, a white spot on the impression would be the result. Keeping this in view, and bearing also in mind that no cutting or corroding is employed, the process and the effect produced will be readily understood.

While the ground is clean it presents a dull whitish surface, on which a black outline is clearly seen. A squared reducing is made on paper as formerly described, and the grounding on the plate made the exact size of the reducing. Divisions are then set off round the edge of the ground similar to those on the reducing to serve as points from which to draw pencil lines forming similar squares on the plate, and which are reproduced during progress. These squares being drawn, scraping may be commenced without further preparation if the subject is very simple, but if it be full of details, the outline must be traced on by interposing between a tracing of the reducing and the ground a piece of thin paper covered on one side with lamp-black, and going over the outline with a blunted point. The highest lights are now scraped out, and the artist, passing to those of the next degree, making out forms as he goes on, descends gradually to the darkest shades, for which he leaves the ground untouched. The outline and masses of shading being secured, a proof is taken, after which the grounding is cleaned, the squares reproduced, and the minuter forms and gradations of tone more perfectly obtained. These operations are repeated, and frequent partial reproduction of the squares resorted to till the last general toning is entered upon. Should any part be made too light, small cradles are used to restore shading. Pure mezzotinto is easily distinguished by the total absence of lines or dots. A small example of the manner will be found in Pl. LIV. fig. 6.

The Mixed Style, as already noticed, is based on mezzotinto, which, still forming the great mass of shading, is in this method combined with line and stipple in such proportions as the taste of the artist suggests. All the tools employed in other styles are required for this; the roulette being largely used in subordinate parts.

In executing a mixed plate, a general mode of procedure is first to etch and bite in the outline and details of form as if for stipple, and then to have the plate covered with a mezzotinto grounding, on which the same process is gone through as in pure mezzotinto. Next, a thick etching ground is laid, and all parts it is desirable to etch are freely treated with the point and roulette, the subject being afterwards finished by further scraping and burnishing. Some artists prefer, however, to commence with pure mezzotinto, adding line and stipple in limited proportions; but in large plates every means which will give richness of effect are adopted without regard to regularity of style or neatness of handling. The well-known print of Bolton Abbey in the Olden Time may be cited as a fine example of the mixed style.

It is proper to notice here, that, excepting in the initiatory steps, there is no regular order of procedure observed in executing a plate in any style of engraving; but the variations are not so important as to affect the general accuracy of the descriptions given.

The following are a few of the most celebrated engravers, with the dates of their births and deaths, so far as these have been recorded:—

Italian Engravers in Line.—Andreas Mantegna, 1431-1505; Marc Antonia Raimondi, b. 1487; Marco da Ravena, b. 1496; Giovanni Volpato, b. 1738; Raphael Morghen, 1755-1833; Guiseppe Longhi, 1766-1831; Pietro Anderloni, b. 1784. Among the more recent Italian engravers of eminence are Toschi, Garavaglia, and Jesi.

[1] The operation of grounding is thus performed. A series of vertical lines are drawn on the plate at intervals equal to about one-third the curved face of the cradle, which is then placed upright across the two first lines at one end, and with firm pressure, and a slow progressive motion, is rocked from side to side along the whole length in the direction of the lines; the teeth on the edge covering with small indentations the space travelled over. The like operation is repeated in all the remaining spaces. Another set of similar lines are next drawn across, at right angles to the first, and the cradle passed along and between them as before. Systems of diagonals are now drawn in rotation, crossing and recrossing each other, all of them being severally and successively operated upon with the cradle. This done, the plate has got what is termed *one turn*; but to obtain the intensely rich black of a fine mezzotinto, many such turns are necessary.

German, Dutch, and Belgian Engravers in Line.—Albert Durer, 1471-1528; Cornelius Cort, 1536-78; Hubert Goltzius, b. 1558; Lucas Vorstermann, b. 1580; Cornelius Visscher, 1610-70; Gerard Edelinck, 1627-1707; Jacob Hanbraken, b. 1698; George Frederick Schmidt, 1712-75.

French Engravers in Line.—Anthony Masson, 1636-1700; Gerard Audran, 1640-1703; Drevet the elder, 1664-1739; Drevet the younger, 1697-1739; J. G. Wille, 1717-1807. Of modern French engravers, Dupont, Bridoux, Forster, and Français are in the first rank.

British Engravers in Line.—Wenceslaus Hollar, 1607-77; W. Faithorne the elder, 1620-91; David Loggan, b. 1630; George Vertue, 1681-1756; F. Vivares (landscape), 1712-82; John Browne (landscape), b. 1719; Sir R. Strange, 1721-93; W. Woollet, 1735-85; F. Bartalozzi, 1730-1803; John Hall, 1739-97; W. Sharp, 1749-1824. To these may be added the eminent names of John Burnet, George T. Doo, John Horsburgh, J. H. Robinson, J. H. Watt, and Lumb Stocks. The British landscape engravers of the present century excel all others. Amidst a great wealth of talent, the names of W. Miller, John Pye, W. E. Cook, E. Goodall, John Cousen, J. T. Willmore, R. Brandard, W. Forrest, and W. Richardson are pre-eminent.

Engravers in Stipple.—W. Wynne Ryland, b. 1732; R. Cooper, b. 1780; Henry Meyer, b. 1782. In the present century are—Meadows, H. Robinson, H. T. Ryall, William Holl, Francis Holl.

Engravers in Mezzotinto.—John Smith, d. 1720; John Raphael Smith, 1750-1812; Valentine Green, 1739-1818; Richard Earlom, d. 1822; James Ward, 1801-40. Second to none is the veteran Samuel Cousins, the most eminent mezzotinto engraver of this century. Of French engravers in mezzotinto, the most noted are Jazet, Girardet, and Girard.

In *Aquatinta*, the only noteworthy engraver is Paul Sandby, 1732-1809.

For full information of engravers and their works, see Bryan's Dictionary of Painters and Engravers, and Strutt's Biographical Dictionary of Engravers.

Engraving on Wood.—Impressions taken from a fine wood-cut and from a line-plate assimilate very closely in point of style, the shading of both being composed of lines. But while the impressions thus resemble each other, the engraving itself, as it appears on the plate and on the block, and the manner of printing, are widely different. In the plate the lines forming the shading are cut into the metal, and when printed are filled with ink, and the surface wiped clean; but in the wood block the spaces between the lines are cut out, leaving the lines standing up like type, and, like them, are printed by inking the surface. The wood best adapted for engraving is box. It is cut across the grain in thicknesses equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away, and the lines giving form, shading, texture, &c., produced in relief, by excavations of varied size and character, made between them by gravers of different forms. The ordinary method of drawing on wood is first to coat the block very thiuly with white. The outline is then traced on, the masses of shading washed in with Indian-ink, and the parts detailed and finished with black-lead pencils. This manner leaves much of the ultimate success of the cut dependent upon the skill of the engraver; but another mode, denominated the fac-simile style, in which all the shading is done in lines with the pencil alone, leaves nothing for him to do but to cut out the parts untouched by the pencil. The tools required for wood engraving are more numerous than those of the plate engraver. Besides the different lozenge-gravers for general use, tinting tools or *knife*-gravers are employed for cutting out the deep, narrow spaces between closely set lines, &c.; there are also small gouge and chisel shaped instruments used to scoop out the larger unshaded parts, and to cut away the superfluous wood at the sides of the block. See WOOD ENGRAVING.

Die Sinking and Stamp Cutting.—These branches of engraving are sometimes combined; but the medallist, while he is, strictly speaking, a die-sinker, confines himself exclusively to his own high department of art. (See NUMISMATOLOGY.) Dies are made of the finest steel, and are usually conical in form, the apex being made the size and shape of the intended device. They are carefully softened by annealing before being engraved, and are hardened when finished. Engraved dies are used for striking up, by means of a screw-press, the devices on coins, medals, &c., and the raised ornaments on many of the decorated metal articles in common use. The tools employed in die-sinking are very similar in form and variety to those used in wood engraving; but sets of punches, engraved in relief and hardened, are used for the small details. In common ornamental dies the devices, often repeated, are formed almost entirely by punches. Great nicety of manipulation is demanded in die-engraving; the device is cut or hollowed out below the surface, the impressions struck from it being necessarily in relief, or standing above the surface. Should a serious error be made, the face of the die is filed down till the part is brought within possibility of correction, when the whole work must be gone over again. See COINAGE.

Stamp-cutting includes, in its practice, the decorative tools used by the bookbinder, and metal stamps of all descriptions, in which the impression taken in ink, gold, &c., is made by the *surface* of the ornament, device, or letters cut in relief on them. The process of engraving metal stamps is precisely the same as that of engraving on wood; the parts intended to impress being left standing up in relief.

Engraving on Precious Stones; Seal or Gem Engraving.—The practice of this elegant art is essentially the same now as in those remote times which produced the much-prized engraved gems denominated *antiques*. The tools of the gem-engraver are small disk-shaped, spherical, and cylindrical instruments, varying in size from a mere point to ¼ inch in diameter; they are simply the ends of pieces of soft iron wire filed into the requisite shapes, the other end of the wire being embraced by a conically-shaped piece of lead. When the tool is used the leaden end is fitted into the perforated axis of a small grooved wheel placed within the rounded top of a small pillar, erected on the table at which the artist sits. A thin band of gutta-percha passes round the small wheel and a large wheel under the table, and the ordinary crank and treddle wrought by the foot, giving motion to the wheels, causes the tool to revolve rapidly. The first procedure of the engraver is to dim the surface of the stone with emery powder, and to draw on it the outline of his subject with a brass point. One of the small disk-shaped tools is then fitted into the machine, and, being set in motion, it is coated with diamond powder moistened with oil. The stone is now applied with gentle uniform pressure to the revolving tool, which, by virtue of the diamond powder incorporated with its surface, cuts or engraves the outline in shallow lines by a process of grinding. The forms and modelling of the device are then hollowed out with the rounded tools, impressions being taken at intervals with softened bees'-wax to ascertain progress. (See GEM SCULPTURE.) The same means are sometimes used for cutting devices for seals on metal, by substituting steel tools, roughened like files and hardened.

ENGROSSING, in law, denotes extending a deed, or re-writing it out fully in fair and legible characters; also, buying up large quantities of corn or other produce, to enhance the price (see next article).

ENGROSSING, FORESTALLING, and REGRATING. The uncertainty of seasons, and the consequent fluctuations in the supply of food, expose every populous country to a natural danger of periodical famine. To this hazard of a periodical failure of the means of subsistence animals in a state of nature are exposed as well as men; and although they have a natural resource against it in migration, which is not suited to the settled habits of human society, even this provision of nature sometimes proves ineffectual. Buffon relates how the swallows in France perished in great numbers during a cold season unfavourable for insects; how they were obliged to rob the spider of his prey, and finally to destroy even this means of subsistence by swallowing the spider himself. The natural resource of human society against famine is commerce. It is only, however, in a tolerably advanced state of civilization that this resource comes to be effective. At the present day, among the more advanced communities of Europe, America, and Australia, such a thing as famine is almost unknown. A combination among countries so widely extended, and so differently placed in regard to natural circumstances, places them beyond the range of the local fluctuations of seasons. But it is different with the less commercial countries of Asia; and large districts even in our own East India possessions are still exposed to devastating periodical famines. It is likewise very recently that the immunity of even the most civilized community from famine has become as perfect as it now is. Freedom of communication and the absence of serious obstructions to commerce are both indispensable to give this immunity. The science of communication has recently undergone a development greater than has ever been known in the previous history of the world, so that the time may now be confidently counted on when famines will be unknown everywhere; but before this recent development of communication political obstructions to commerce, arising from the jealousies of peoples imperfectly acquainted with each other, and the personal ambition of too powerful potentates, were much more common than now, hence the protection of commerce was rendered more uncertain, and the risk of famine more real than even the actual state of commercial development made inevitable. From the earliest period of history we find that this danger was itself a cause of political complications, and that the means of providing against it exercised the skill of statesmen and legislators. The history of Joseph in Egypt is well known. His policy seems to have been well adapted to the circumstances of a country depending on its own resources, and might possibly still be applied with advantage in India. It was not always, however, that the policy of either people or rulers was as well adapted to the danger to be provided against. In the circumstances we have described there would naturally prevail among both an extreme jealousy and sensitiveness, such as can hardly now be appreciated, in regard to the supply of corn and other indispensable products of the soil. This jealousy is expressed proverbially in the collection of sayings of the wise King of Israel, Prov. xi. 26. In our own country the means of communication were long so imperfect that local famines were apt to arise even where there was no general scarcity of the means of subsistence. In these circumstances the trade in corn became a subject of common jealousy and suspicion, and not only by positive statute, but by the common law of England, was subjected to restrictions the tendency of which was the very opposite of what they were designed to produce. Among the worst of these injurious laws were the positive statutes, and the legal maxims which they served to create and foster, against the imaginary crimes called *engrossing*, *forestalling*, and *regrating*. Positive statutes against these supposed crimes were passed in 1266–67 (51 Henry III. st. 6, sec. 3), in 1350–52 (25 Edward III. st. 4, cap. iii.), in 1552 (Edward VI. act 6, cap. xiv.), in 1562 (Elizabeth, act 5, cap. iv. sec. 13) and in 1570 (Elizabeth, act 13, cap. xxv. sec. 5).[1] These restrictions were not entirely confined to the trade in corn, although it was always one of their chief objects. The offence of *engrossing* was described by the statute of Edward III. as the 'getting into one's possession, or buying up large quantities of corn, or other dead victuals, with intent to sell them again;' *forestalling* as the 'buying or contracting for any cattle, merchandise, or victual, coming in the way to the market, or dissuading persons from bringing their goods or provisions there, or persuading them to enhance the price when there;' and *regrating*, 'the buying of corn or other dead victual in any market and selling it again in the same market, or within 4 miles of the place.' By the statute of Edward VI. the engrossing of corn, which included the buying of it in one market to sell it in another, was made punishable by imprisonment and pillory; and no one could carry corn from one part of the kingdom to another without a licence. The granting of this licence was confided, in the reign of Elizabeth, to the quarter-sessions. The existence of such statutes, and especially the state of opinion of which they formed the expression, could not fail to operate upon the common law; and when, after various modifications, passed at different times, especially in 1624 and 1663, all the positive statutes against these offences were repealed by the act 12 George III. cap. lxxi., passed in 1772, they were still found to be punishable by common law. Accordingly, by act 7 and 8 Victoria, cap. xxiv., passed 4th July, 1844, the offences of engrossing, forestalling, and regrating, with some similar ones, were abolished throughout England, Scotland, and Ireland; and no prosecution is now allowed on account of them, either at common law or in virtue of any statute. The Scottish laws against engrossing, forestalling, and regrating are much later than the English statutes, from which they were probably borrowed. They appear to have rested chiefly on act of 1592; and before their direct repeal by the above statute they had already long fallen into desuetude.

ENHARMONIC, in music, is an epithet applied to intervals smaller than the regular divisions of the scale. The interval, for example, between C sharp and D flat (which on tempered instruments are played on one note) is called an enharmonic interval. The ancients had a mode of music which they called enharmonic, but it is not agreed among critics to what mode of progression they applied the term.

ENIGMA. See ÆNIGMA.

ENKHUIZEN (Latin, *Enchusa*), a town, Holland, on a projection in the Zuider Zee, 29 miles north-east of Amsterdam. It is regularly built, nearly in the form of a circle, has several handsome edifices, and was once a place of great importance, with a chamber of the East India Company, numerous commercial establishments, and a population of 40,000, now reduced to 5000.

ENLISTMENT. There are two modes by which the standing forces, military or naval, of a state may be maintained; either by forced conscription or by voluntary enlistment. The former method is adopted in most military countries, including the majority of European states; the latter is found preferable in countries like our own in which the mercantile spirit prevails. We have already described the former (see CONSCRIPTION); it is of the latter alone we have here to treat. The English laws in regard to enlistment

[1] Woodward and Cates.

deal with two subjects, the enlistment of forces by the government of the country for the service of the state, and the attempts of foreign powers or their agents to enlist British subjects for foreign service.

Up till the year 1802 the enlistment of men for the British army was left in the hands of private undertakers, or middlemen, who received a commission on the recruits they procured, but the abuses of this system now induced the government to take the matter under their own management. At an early period enlistment was for short periods, but this was soon changed to enlistment for life. No greater mistake could have been committed. To compete for their soldiers in the open market with the farmer, the tradesman, and every other private hirer of labour, was a sufficient disadvantage to a government which had to cope with armies raised by conscription, but to put unnecessary restrictions upon enlistment and make its service almost penal was at once to limit itself for recruits to the dregs of society. Even conscription did not extend beyond a limited series of years. It is usually long, however, before such plain matters become understood, and even the act of 1847 was only a slow step in the right direction. This act (10 and 11 Victoria, cap. xxxvii.) limited the term of enlistment to ten years for the infantry and twelve for the cavalry, artillery, and ordnance; re-enlistments for periods of eleven and twelve years might be made within six months before the period of the first term, or within three years if engaged in foreign service; the commanding officer might likewise prolong the period of service of a soldier on foreign service for two years after his term had expired. A retiring pension was allowed only for serving the full time after re-enlistment. A partial change in the term of enlistment was made during the Crimean war, and further changes were made by the Army Enlistment Act of 1870 (33 and 34 Victoria, cap. lxvii.) According to this act all enlistments are to be for general service, and not for any particular regiment. The recruit may either engage for long or short service. By the former he engages first for twelve and afterwards for nine years, and receives a pension on completing his term; by the latter he serves six years in the regular service and six years in the first class reserve. While in the reserve he may reside and carry on business where he pleases, but is liable to short periods of service, and may be called out again on an emergency. He receives 4*d.* per day while on reserve, and if called out again his service counts towards good-conduct pay. A soldier abroad, when his service expires, may be detained not more than twelve months, and is sent home at the public expense. By the Mutiny Act the recruit must take an oath of enlistment before a magistrate to show that his enlistment is voluntary, but he cannot retract after his engagement without paying a fine. Up till the act of 1870 a bounty was given to recruits to induce them to enlist. This improper bribe was abolished by this act.

The navy requiring a service of skilled men, it was long deemed that voluntary enlistment would not suffice to recruit it, and a system of impressment, not from among the general population, but from the seafaring portion of it, was systematically used in recruiting for the navy. Had this impressment been regularly organized on a system of conscription, it would at least have been impartial and not more oppressive than the service of the country might have been supposed to require. But the impressment was arbitrary, conducted by press-gangs, who forcibly seized the first likely seaman they could find. This barbarous mode of recruitments was recognized by many statutes from the time of Richard II. to that of George III., which still stand unrepealed; but after the peace of 1815 the mode of recruiting by bounties was substituted for it. As late as 1847, however, it was enacted that seamen whose qualifications entitled them on enlistment to double bounty should be formed into a class, and that government might by a proclamation prohibit shipowners from hiring persons of this class! A seaman may engage for five or ten years, for the period his ship is in commission, or for a longer period. He receives higher pay for longer service.

Various acts have been passed against the enlistment of British subjects for foreign service. Until recently this was regulated by act 59 Geo. III. cap. lxix. (1819). This act was repealed by 33 and 34 Victoria, cap. xc. (1870), which imposes penalties against the acceptance of commissions or engagements in the military or naval service of any foreign state at war with any foreign state at peace with her majesty.

ENNIS, a town and parliamentary borough, Ireland, county Clare, on the Fergus, 19 miles north-west of Limerick. It has a mean, straggling, and disorderly appearance, but contains many neat detached houses; the streets are in general narrow, crooked, and irregular, and not remarkable for cleanness. The public buildings are the Protestant Episcopal church, a Roman Catholic chapel, Methodist and Independent meeting-houses, a Roman Catholic college, National and other schools, a town-hall, court-house, hospital, prison, and barracks. Some linen and flannel are manufactured, and a considerable trade carried on in grain, flour, and agricultural produce. Pop. in 1871, 7175.

ENNISKILLEN, a market town and parliamentary borough, Ireland, county Fermanagh, on an island in the river which connects the upper and lower sections of Lough Erne, with suburbs on both sides of the adjoining mainland, with which it communicates by two elegant bridges, 34 miles north-east of Sligo. It is well-built, cleanly, and thriving. It has a county court-house, prison, infirmary, and two barracks, one of them for artillery. Tanning, brewing, &c., are carried on, and the trade is considerable. Enniskillen returns a member to the House of Commons. Pop. in 1871, 5906.

ENNIUS, QUINTUS, an early Latin poet, considered by the Romans as the father of their literature, was born at Rudiæ, near Brundusium, 239 B.C. In early life he is supposed to have served as a soldier. When he was about thirty-eight years of age Cato the Censor brought him to Rome, where he soon gained the friendship of the most distinguished men, and instructed the young men of rank in Greek. With an extensive knowledge of the Greek language and literature he united a thorough acquaintance with the Oscan and Latin tongues, and exerted great influence on the last. He died at about seventy years of age. He wrote an epic, Scipio, in hexameters; Roman annals; tragedies and comedies; satires, epigrams, precepts, &c. His whole works are supposed to have been extant up to the thirteenth century, but nothing now remains but fragments quoted from other ancient authors, many of which are mere citations by grammarians and other insignificant extracts. A few larger fragments have been preserved, which give a favourable impression of his genius. He may be considered the former of the Latin language. His success in his own day was great. His poems were for a long period read aloud to admiring multitudes, and they have been generally quoted and admired by the great writers of antiquity.

ENNS (Latin, *Anisus*), a river in Austria, which rises in the north slope of a branch of the Noric Alps, in Salzburg, about 12 miles south of Radstadt, flows nearly due north to that town, then E.N.E. across

the north part of Styria, then circuitously N.N.W. into the Archduchy of Austria, separating and giving name to the two great divisions of Austria above and Austria below the Enns, or Upper and Lower Austria, and finally enters the Danube on the right bank, a little below the town of Enns. Total course about 160 miles. In the lower part of its course it becomes navigable.

ENOCH, one of the patriarchs who lived before the deluge. He became the father of Methuselah at the age of sixty-five years; and at the age of 365 years 'God took him.' The words quoted are generally understood to mean that Enoch did not die a natural death, but was removed as Elijah was. Paul (Heb. xi.) confirms this view.

ENOCH, BOOK OF, an apocryphal book of an assumedly prophetical character, to which considerable importance has been attached on account of its supposed quotation by St. Jude in the 14th and 15th verses of his epistle. The Book of Enoch is referred to by many of the early fathers. Tertullian (on account of Jude's quotation) believed it to be canonic. Justin, Irenæus, Clement of Alexandria, Origen, and Augustine, all appear to have been acquainted with it. After this time it appears to have been lost to the Western Church, and until the close of last century was known in Europe only by the references of these and other early writers, and by the passage of St. Jude supposed to be founded on it. On his return from Egypt Bruce brought with him from Abyssinia, where it was still extant, three manuscripts containing a complete Ethiopic translation of it. It has since been repeatedly published, translated, and criticized in Europe. The most complete edition is that of Dillmann (Leipzig, 1853), which gives the Ethiopic text, a German translation, with an introduction and commentary. The Ethiopic version is translated from the Greek, but it is a disputed point whether the original was Greek or Hebrew. The date of the book is also much disputed, and also whether it has been written at one or various periods. It is also disputed whether it is really quoted by St. Jude, or whether the allusion in the epistle is not to an oral Jewish tradition. The mere fact of the supposed quotation has led some authorities to assume that the Book of Enoch was written after the epistle, and the same assumption has been more generally founded on the allusions to Christianity contained in the book, which others suppose to be interpolated. The Book of Enoch consists of revelations supposed to have been made to Enoch and Noah. The revelations refer to the state of future blessedness, of judgments upon the wicked, and of the coming of the Messiah. They are full of elaborate imagery founded on the Book of Daniel and other portions of the Old Testament, upon which the dogmatical teaching of the Book of Enoch is also founded.

ENOS, a maritime town of European Turkey, on the north coast of the Grecian Archipelago, on a point of land at the entrance to the Gulf of Enos, south side, 70 miles south by west of Adrianople. It has a commodious but shallow harbour, and has a considerable traffic with the adjacent country. It is the port of Adrianople, with which it has some trade in wool, camels' hair, cotton, leather, saffron, silk, wax, and copper. Pop. 7000.

ENROLMENT (English law). By act 27 Henry VIII. cap. xvi., called the *statute of enrolment*, amended by 3 and 4 William IV. cap. lxxiv., it is provided that every transfer of lands by bargain and sale must be registered in Chancery within six months. A decree pronounced in a suit in Chancery after enrolment can only be reversed or altered by appeal to the House of Lords, or by a bill of review. If a *caveat* against the enrolment of the decree is entered, a petition of appeal or re-hearing must be presented within twenty-eight days, otherwise the enrolment may be effected.

ENSIGN (Latin, *insigne*), the officer who carries the flag or colours, being the lowest commissioned officer in a company of infantry. In naval language the ensign is the flag over the poop or stern of a ship which distinguishes the ships of different nations.

ENTABLATURE, the horizontal, continuous work which rests upon a row of columns. See ARCHITECTURE.

ENTAIL, or TAIL. An estate-tail is a freehold of inheritance limited to a person and the heirs of his body, with such particular restrictions as the donor may specify. By the statute De Donis Conditionalibus, Edward I. cap. i., passed in 1226, it was provided that if the donee of an estate in tail should have no heirs the estate should revert to the donor. This has been modified by various statutes, and finally by 3 and 4 William IV. cap. lxxiv. Entailed estates are divided into *general* and *special*, the former when the estate is given to the donee and his heirs without exception, the latter when the estate is limited to certain heirs to the exclusion of others; and into *male* and *female*, according as females are or are not excluded from the succession.

ENTERITIS (from Greek *enteron*, an intestine), inflammation of the intestines. It is known by the presence of fever, fixed pain in the abdomen, costiveness, and vomiting. The causes are acrid substances, indurated fæces, long-continued and obstinate costiveness, spasmodic colic, and a strangulation of any part of the intestinal canal; but another very general cause is the application of cold to the lower extremities, or to the belly itself. It is a disease which is most apt to occur at an advanced period of life, and is very liable to a relapse. It comes on with an acute pain, extending in general over the whole of the abdomen, but more especially round the navel, accompanied with eructations, sickness at the stomach, a vomiting of bilious matter, obstinate costiveness, thirst, heat, great anxiety, and a quick and hard small pulse. After a short time the pain becomes more severe, the bowels seem drawn together by a kind of spasm, the whole region of the abdomen is highly painful to the touch, and seems drawn together in lumpy contractions; invincible costiveness prevails, and the urine is voided with great difficulty and pain. The inflammation, continuing to proceed with violence, terminates at last in gangrene; or, abating gradually, it goes off by resolution. Enteritis is always attended with considerable danger, as it often terminates in gangrene in the space of a few hours from its commencement. The treatment must be begun by taking blood freely from the arm as far as the strength of the patient will allow; but the disease occurring more frequently in persons rather advanced in years, and of a constitution somewhat impaired, it becomes more important to limit this evacuation, and rely in a great measure on the effects of a number of leeches applied to the abdomen. Another very useful step is to put the patient into a hot bath, which may presently induce faintness; or, where this cannot be procured, fomenting the abdomen assiduously. When the symptoms are thus materially relieved an ample blister should be applied. It becomes also of the first importance to clear out the bowels. After the disease is removed care should be taken to guard against accumulation of fæces, exposure to cold, or anything else likely to occasion a relapse.

ENTOMOLOGY. The Greek word, *entoma*, from *en*, in, and *temnein*, to cut, was applied by Aristotle to the articulated animals generally, and its Latin

translation, *insecta*, had the same wide meaning, being used for all animals with notched or insected bodies, the transverse division or segmentation of the body being the most conspicuous feature of these animals. But entomology and *insecta* have both undergone restriction, and the true insects which now form the province of the entomologist are those articulated or arthropod animals which have the head, thorax, and abdomen distinct; which have one pair of antennæ, three pairs of thoracic, and no abdominal limbs, in which respiration is aerial, and is effected (when special organs exist) by tracheæ or involutions of the integument, forming a tubular network through the body; in the majority two pairs of wings are borne by the thorax. The definition here given was outlined by Latreille, Histoire Naturelle des Crustacés et des Insectes (Paris, 1802–4), and the Crustaceans, Myriapods, and Spiders now form distinct classes; while the Chitons, whose shells, made up of separate pieces succeeding each other from before backwards, conformed to the earlier arbitrary definition, are restored to the molluscs, with which class their anatomy and history identify them. Reserving for the article INSECTS what requires to be said of the affinities of the class, it may be useful here to indicate the relative importance of the groups illustrated on the adjoining plates. Insects are divisible into two groups, Mandibulate and Haustellate: the oral apparatus of the former being adapted for mastication, that of the latter for the imbibation of liquid food. The orders of insects are arranged under these heads as follows:—

A.—MANDIBULATE. Order 1.—Coleoptera. 2.—Orthoptera. 3.—Neuroptera. 4.—Strepsiptera. 5.—Hymenoptera.
B.—HAUSTELLATE. Order 6.—Aphaniptera. 7.—Aptera. 8.—Hemiptera. 9.—Diptera. 10.—Lepidoptera.

The *Coleoptera* or Beetles are a very natural group, of which the most characteristic feature, that to which they owe their name, is the firm sheath which the first pair of wings form for the protection of the second pair, the outer cases being in some genera firmly united to each other, and the second pair functionally useless. The antennæ vary in form, being very short in *Bostrychus*, Pl. LVII. LVIII. fig. 17, while their great length, as in the goat-beetle, fig. 19, is characteristic of a large family, the Longicorns; the Lamellicorns have the last joints of their antennæ elongated on one side into a series of broader or narrower plates, like the leaves of a book, as in the boring-beetle, fig. 1, and the cockchafer. The Clavicorns, or those whose antennæ end, club-like, in an enlarged extremity, are illustrated by the weevils, fig. 14. The number of joints in the tarsus is also a basis of arrangement, the Pentamera, Trimera, and Heteromera corresponding to groups in which the numbers are, five, or three in all, or different in different limbs. The oral appendages are of great interest: the mandibles and both pairs of maxillæ are hard and useful in cutting, and are so throughout life, the habits of the larvæ being the same as those of the adult. The larvæ, figs. 3, 5, in passing to the imago or adult form, undergo slight change, and the sheath of the pupa, in place of forming a simple investment, as in the butterfly, fig. 48, incloses each limb in a separate investment. The beetles have the simplest life history, the change from larvæ to adult being so slight. Order 2. The *Orthoptera* and *Neuroptera* are not well defined from each other, the dragon-fly, Pl. LV. LVI. fig. 20, and the ant-lion, fig. 26, showing the imperfect distinction of appearance. The figs. 1–24 illustrate the present limits of the Orthoptera, at least as accepted by a large number of writers. The Termites, figs. 1–8, show those remarkable variations within the limits of one species which correspond to the wonderful social instincts of the genus. The cockroach, fig. 9, and the earwig (*Forficula*), fig. 16, are examples of resemblance to the beetle, in that the anterior wings are firmer and more sheath-like than in the Termes; while all the genera show that the possession of wings, whether or not a sexual character, has very direct reference to function; the worker, fig. 1, and the soldier, fig. 2, not needing them; hence the view suggested that the wings are a late acquisition in the evolution of insects, the worm-like young of which being alike in so many orders, may perhaps represent the ancestral condition. The locust, fig. 15, and grasshopper, fig. 14, contrast in many ways, the latter insect showing a very remarkable modification of the last wings of the abdomen into the sword-like ovipositor seen in the fig. Figs. 21–14 refer to anomalous forms, whose position is uncertain. The supporters of the hypothesis above mentioned regard them, especially the Thysanura, fig. 23, as indicating the primitive condition of the class. The Dragon-flies and the Ephemera, fig. 19, are interesting, on account of the aquatic life of their larva, whose history will be found under EPHEMERIDÆ. Order 3. *Neuroptera*. The May-fly, fig. 29; the scorpion-fly (*Panorpa*), fig. 28, the ant-lion (*Myrmeleo*), figs. 25, 26, represent this order, in which, as in the preceding, the oral apparatus is intended for mastication; the wings never tend towards the coleopterous type. The development is accompanied by complete metamorphosis. The caddis-worms are the larvæ of the May-fly, which leave the water to attain maturity. Fig. 25 shows the pit dug by the larva of the ant-lion, which lies at the bottom on the watch for insects that may tumble down the loose slopes. Order 4. *Strepsiptera*. *Xenos*, fig. 30, is one member of this small group, the short-lived males of which are winged, the females worm-like, parasitic. The larvæ gain admission to the bodies of hymenopterous larvæ, with whose development they keep pace, their final change coinciding with the death of their host. Order 5. *Hymenoptera*. The membranous wings of this order are all equally fitted for flight, and during rest are placed horizontally, Pl. LVII. LVIII. figs. 23–45. In the bee, the type of the order, the maxillæ, fig. 23, are elongated so as to form a kind of sheath round the still longer under-lip, which serves as a suctorial tube, and which, when not used, is folded up like a clasp-knife under the head: the mandibles retain their cutting form. The order is therefore transitional to the haustellate. Again, as in the Orthoptera, there is a wonderful history of social organization among bees, wasps, and ants; and with the division of labour, physical differences in the labourers coincide. Males and females are recognizable; workers, soldiers, slaves, are found in the communities. Again, the presence or absence of wings corresponds more to function than to sex. Order 6. The *Aphaniptera*, or fleas, are often referred to the order *Diptera*. Their wings are rudimentary, appearing as lateral scales. The proboscis is formed of the lower lip, and is open in front, the mandibles forming a boring instrument with serrated margins. Order 7. The *Aptera*, or lice, entirely want wings, and the thorax is both indistinctly segmented and imperfectly marked off from the abdomen. The oral appendages are irrecognizable; the whole being transformed into a fleshy protrusible tube, within which four fine rods combine to form a tubular stilet. The almost larval condition of the body brings them very near to the parasitic members of the next order. Order 8. *Hemiptera*. The proboscis is derived from the lower lip, the mandibles and maxillæ being reduced to the condition of setose organs. In many respects the order resembles that of Orthoptera, the anterior wings being either firmer than the posterior, or the thicken-

ing is confined to the proximal half. Again, there is great modification of the limbs for running, springing, and the like; while the development is incomplete, the larva resembling the adult. The *Heteroptera* have the wings, when at rest, horizontal, and the sheath-like modification of the anterior pair is confined to the section which is illustrated on Pl. LIX. LX. figs. 27–35. The *Homoptera* have the wings sloped when at rest, fig. 36, Cicada; and 39, the insect of the familiar cuckoo-spit. Both wings are membranous. Besides the large family of Cicadas, the Homoptera include the plant-lice, mealy bugs, and scaly bugs, as the cochineal insect, fig. 42. The wingless neuters of the plant-lice, which bring forth living and mature progeny to the extent of millions in a season, give the grandest example of a sexual reproduction in the class of insects. Order 9. *Diptera.* The house-fly, with its single pair of membranous wings, the posterior pair being converted into poisers, *halteres*, such as are seen in fig. 18, is a good example of an order which, as here restricted, is a natural one. The metamorphoses of the Diptera are also familiar, the maggot of the flesh-fly, a limbless worm, with suctorial mouth, departing from the ordinary type of larvæ, which have three pairs of limbs and masticatory jaws. The proboscis of the adult is derived from the upper and lower lips, the mandibles and maxillæ taking no share in it. While some of these Diptera are harmless scavengers, like the house-fly, others, as the breeze-fly, figs. 12, 13; *Tachina*, fig. 22; bot-fly, fig. 23, are injurious to other animals. The sting is irritating, and causes fever in man and beast; and this, as well as the pertinacity with which the eggs are laid on raw surfaces of living bodies, form insuperable obstacles to the maintenance of certain animals in some regions; thus in Eastern and South Africa the camels, horses, and domestic cattle are victims of a dipterous insect; while the colts in Paraguay die of the larvæ which hatch out of eggs deposited on the navel. Order 10. *Lepidoptera.* The butterflies, or diurnal, and the moths, or the chiefly nocturnal members of this group have a long proboscis, which is, when not in use, coiled up under the head; the maxillæ form the two halves of this organ, whose parts are therefore at right angles to that of Diptera. The mandibles and lips take no part in its formation. The high specialization of the organ throughout the order, coupled with the complete metamorphosis (the larva, with masticatory jaws, showing, moreover, in the false feet of the abdomen, an analogy to the arrangement in Myriapods, fig. 46, or even perhaps in worms), renders the *Lepidoptera* a summary of the class, and justifies the classification of the Coleoptera as the lowest group.

The following is the grouping of the figures on the Plates:—

Plate LV. LVI. figs. 1–24.—Orthoptera. 25–29.—Neuroptera. 30.—Strepsiptera. 31–63.—Coleoptera.

Plate LVII. LVIII. fig. 1–22.—Coleoptera. 23–45.—Hymenoptera. 46–65.—Lepidoptera.

Plate LIX. LX. fig. 1–10.—Lepidoptera. 11–25.—Diptera. 26.—Aphaniptera. 27–42.—Hemiptera. 43, 44.—Aptera. Fig. 45–49.—Myriapoda. 45, 46.—Chilognatha. 47–49.—Chilopoda.

Fig. 50–60.—Arachnida. 50.—Scorpionida. 52–58.—Araneida. 59, 60.—Acarina.

ENTOMOSTRACA. When Latreille established the Crustaceans as a separate class, he divided it into two—the *Malacostraca*, including the Decapods, Amphipods, and Isopods; and the *Entomostraca*, embracing all the other members of the class. The term is now restricted to a sub-class, under which are enumerated the *Lophyropoda*, *Ostracoda*, *Copepoda*, *Branchiopoda*, *Cladocera*, *Trilobites*, and *Merostomata*. But these groups are scarcely capable of inclusion under one definition, which shall at the same time exclude the Cirrhipeds and parasitic crustaceans. Hence differences exist in the use of the term by various naturalists, and in a few years, probably, the designation will be lost sight of as the progress of embryology leads to more correct views of the affinities of these orders. At present Entomostraca are crustaceans for the most part of small size, whose bodies are protected by a horny or calcareous shell, consisting of one or several pieces, so that the hard part of the animal may resemble that of an amphipod crustacean or a bivalve mollusc; the gills are attached to the locomotive or masticatory limbs; the limbs are jointed, and for the most part spinose (setigerous). The *Ostracoda*, of which the *Cypris* (Pl. XXXVIII. XXXIX. fig. 31) is the most familiar example, have a bivalve shell, hinged by membrane along the dorsal middle line. The appendages, never more than five pairs, are entirely covered in by the valves. The modification of the antennæ into swimming organs is a character of the larvæ of higher orders of crustaceans. The Copepoda are crustaceans with elongated articulated bodies, and no shell: the oral appendages are masticatory in the free-swimming forms, as *Cyclops* (fig. 32), &c., in which, also, there are four or five pairs of bifurcated swimming feet. In the parasitic genera the mouth is variously modified; the limbs are in five pairs in some genera, wanting in the female but present in the male of other genera. The fish-lice and the parasites of fish-gills belong to this group. The water-flea (*Daphnia pulex*, fig. 30) is the well-known representative of the *Cladocera*, in which the body is not articulated, and is inclosed in a bivalve shell, from which the head projects. The Branchiopoda are flat-bodied, with a shield-like carapace, *Apus* (fig. 29); or laterally compressed with a bivalve shell, *Estheria;* or elongated, and without a shield or shell, as *Branchipus* and *Artemia*, the denizens of brine pools. The Trilobites (fig. 28), forms which became extinct in the carboniferous strata, are of uncertain position, since they approach, on the one hand, to the Isopods, and on the other to the King Crabs (fig. 27), which are the only living members of the *Merostomata*, among which are numbered *Eurypterus*, *Pterygotus*, and other genera which did not survive the carboniferous period.

ENTOZOA. This term should, according to its literal meaning, include all animals which pass any period of their lives within the bodies of others not belonging to the same species. Thus the ichneumon, whose larva lives in that of the butterfly, the bot of the horse's stomach, are Entozoa, like the tape-worm. But the term is now restricted to those members of the Annuloid group which are commonly known as worms, and which belong to the orders Trematoda, Nematoda, Acanthocephala, Cestoda. The tape-worms belong to the last order: the head, moored by its hooklets in the intestinal walls of its host, is followed by a cylindrical neck, on which transverse markings indicate the commencement of segmentation. The joints are added at this point, so that the terminal joints are the oldest. There is no mouth or intestinal canal, nutrition and growth depending on absorption, through the body walls, of nutritious fluids from the alimentary canal of its host. So far the tape-worm is not parasitic; it does not live at the cost of its host's tissues, but on the food which the host supplies for himself. That it is moored by the head is the only difference between it and such animals as the crustaceans found within the umbrella of jelly-fishes, where they swim about and pick up food along with the animal under whose shelter they live. This is true *commensalism*, it is truly a common table; but the tape-worm actually diminishes, to a small extent, the food taken in by the animal it

infests, though the mischief it causes is by mechanical irritation, not starvation. The ripe joints or *proglottides*, whose sole contents are the reproductive organs and their products, are set free in the intestine, and, escaping externally, are received into the body of another host, in which the embryo leaves the intestine, and in some tissue, brain or muscle, it passes through the cystic or bladder-worm stage, the hydatids of medical authors. Within these cysts appear the *strobili* or heads, which, when the hydatids are digested by other animals, are set free, and becoming attached to the intestinal wall develope into sexually mature tape-worms. The hydatids are truly parasitic; and the developmental history is one of change of form, change of locality, and of habit. The transfer from one animal to another seems essential to the process, which the preference for one organ or tissue also subserves. The transfer from mice to cats, from dogs to sheep, from dogs to man, and the converse, are easily understood, both vegetable and animal food helping to carry the minute eggs or larvæ. Among the Trematodes are the Flukes, of which there are several families. These flat-bodied parasites range from one-hundredth of an inch to 4 inches in length. Like the Cestoda they pass through phases, each of which is proper to one kind of animal; but the transfer is from invertebrate to vertebrate forms, and the converse. Thus the larvæ, parasitic in fresh-water snails, attain maturity in frogs or ducks. The Nematoda, or filiform parasites, include the familiar thread-worms, the guinea-worm, hairworm. The *Trichina spiralis*, whose larvæ occasion the measle of pork, have even caused the death of men by their numbers and their interference with functions. The Acanthocephala, or thorn-headed worms, of which the *Echinorhynchus*, a parasite of the trout and stickleback, is the type, are moored by the spines on their retractile proboscis; they are dependent wholly on absorption for their nourishment, and travel from fresh-water invertebrates to the fish in which they attain maturity. In this sketch of the classification of internal parasites, which will be spoken of in more detail under THREAD-WORMS, TAPE-WORMS, &c., it has been chiefly desired to point out that migration is necessary for development, and that the changes of form always present structural conditions of an adaptive character—that is, there is a relation between the organization of the animal and the locality in which it is found. The species of Entozoa are enormous, many forms being apparently confined exclusively to one animal. The conditions on which their multiplication depend are want of attention in the cleansing of food, contamination of water by the droppings of animals or the decay of their bodies; and, as regards the individuals, an acid state of the secretions, such as accompanies strumous diseases, is essential for their speedy multiplication.

ENTRE-DOURO-E-MINHO, a province of Portugal, more generally known by the shorter appellation of MINHO (which see).

ENTRE RIOS (between the rivers), a province of the Republic of La Plata, lying between the Uruguay and the Paranà, the former constituting its east, the latter its west and south limits, the province of Corrientes bounding it north. Its area is estimated at 32,000 square miles. The south extremity is a low alluvial plain, subject to annual inundation; towards the north the country has an undulating surface, with an extensive swamp in the interior, overgrown with low trees. There are, however, some large tracts covered with fine grass, which supplies good pasture for cattle and horses, from which all the articles of export—hides, horns, tallow, and jerked beef—are derived. It has numerous rivers, affluents of the Uruguay and Paranà. Cultivation is limited to a few places. The climate is moderate and healthy. The population, which amounts to about 160,000, is much scattered, and almost entirely occupied in the *estancias*, or cattle farms, in which the wealth of the province chiefly consists. The Villa del Paranà or Bajada is nominally the capital of the province.

ENTRY, in English law, a person who has been wrongfully dispossessed of an estate may, according to English law, in certain cases, assert his right by mere entry or taking possession, which must be done separately in each county if the estate lies in more than one. The right of entry must be asserted within twenty years. It is available only in cases where the entry of the possessor is held to have been wrongful in law. In Scotch law, is the investiture of an heir by feudal tenure in his estate by the superior.

ENTRY, BILL OF. See BILL—Bill of Entry.

ÉON DE BEAUMONT. See D'ÉON DE BEAUMONT.

EOS (Latin, *Aurora*), among the ancient Greeks the goddess of the dawn, was the daughter of Hyperion and Theia. She announced the coming of Helios (the Sun), and accompanied him throughout the day. She was in the habit of carrying off youths distinguished for beauty, by whom she became the mother of Zephyrus, Boreas, Notus, &c. She begged of Zeus to make Tithonus, one of her lovers, immortal; but she forgot to ask him to add youth to immortality, so when he grew old and shrivelled she metamorphosed him into a cricket.

EÖTVÖS, JOSEPH, a Hungarian statesman and author, was born at Ofen on 3d September, 1813. He completed his studies in philosophy and law at the University of Pesth in 1831. He had already, before leaving the university, produced three dramas —Kritikusok, Házasulók, and Boszú—the last a tragedy, all of which were well received. He began the practice of law as an advocate in 1838, but soon abandoned it to gratify his taste in travel. He visited Germany, France, England, Sweden, and Holland, and on his return published an important work on the reform of prisons (Pesth, 1838). He became a friend of Kossuth, and distinguished himself as a journalist and in the diet. A collection of his political writings was published in Leipzig in 1846. He still continued to give his leisure to literature, and published a succession of novels—The Carthusian (1841); The Village Notary (A'falu' jegyzöje, which has been translated into English), 1844–46; Hungary in 1514 (1847–48)—giving vivid pictures of Hungarian life in modern and more remote epochs. After the revolution of 1848 he became minister of public instruction under Batthyani, but in a few months he resigned his post and retired to Munich. He remained in voluntary exile for three years, during which he published several works, among which was The Influence of the Ideas of the Nineteenth Century on the State of Society (Vienna, 1851). About the middle of this year he again returned to Hungary, where he remained for about ten years without mixing in politics. During this period he was made vice-president of the Hungarian Academy in 1855, and president in 1866. In 1867 he again became minister of public instruction. He died 2d February, 1871.

EOZOON. This remarkable animal form, the oldest fossil hitherto obtained, was recognized as organic in 1859 by Sir W. Logan, director of the Canadian survey. In 1864 Principal Dawson, of Montreal, ascertained its rhizopodal character, and his judgment has been confirmed by Carpenter, Rupert Jones, Reuss, and other observers. The limestones in which the fossil occurs are highly altered members of the gneissose rocks which are associated as the

Laurentian series of North America, and which, as Dana has shown, are still manifest as at first the shores, and later as the axis of the earliest American land. The fossiliferous portions of the limestone bands are made up of alternate layers of white and green material, the latter being serpentine, the former carbonate of lime and white augite. These superposed layers represent the walls and cavities of a gigantic foraminiferal mass, the cells of which lodged each an individual rhizopod, which is represented by the serpentine that now fills the cavity, while the walls of the chamber are indicated by calcareous matter. After maceration in acid and the removal of the lime, the serpentinous cast of the cells is left, and three kinds of processes are now distinctly seen, namely, circular rods which pass from the cells of one layer to those of another; stoloniferous processes which connect the cells of each layer, and tufts of pseudopodia which ramify in the calcareous skeleton. The stoloniferous processes indicate the point at which, by gemmation, the zoöids, as each of these individuals should more strictly be called, are given off by budding; while all serve to maintain organic connection between the different parts of the colonial mass. The structure is of great interest, since it combines the features which are now characteristic of two distinct groups: the existing Foraminifera are definite in shape, are small in size, and are unattached; the sponges are less regular in form, are attached, and are of various sizes. The earlier form, therefore, is an example of that differentiation which is an essential point in evolution. The organic character of the Eozoön has been disputed by Messrs. Rowney and King on the ground that all the points of structure may be found in the mineral kingdom: but the extreme improbability of all the peculiarities of several minerals concurring over so wide an area of limestone seems to raise an insuperable objection to this explanation of the phenomena. The Eozoön is found in the upper and lower divisions of the Laurentian of Canada, and as these are separated by an unconformity which marks an uncertain interval of time, and are unconformably covered by the Huronian, the antiquity of this fossil is enormous. It may be separated from the commencement of the Silurian series by a period as great as that of the Palœozoic and Mesozoic formations put together. Eozoön has been detected in the fundamental rocks of Bohemia and Bavaria, as well as of Scandinavia, and the presence in these localities of graphite indicates the existence of vegetation at the same early period. Whether or not the smaller size of the European forms is a specific distinction is uncertain, since it must be remembered that the lowest types of organization are those which persist longest without change. It is now certain that the Connemara marble, or Irish green of commerce, does not contain Eozoön, not one of the structural features above mentioned having been detected in it.

EPACTS (*epactos*, added), in ecclesiastical chronology, are the excesses of the solar month above the lunar synodical month, or of the solar year above the lunar year. These excesses are calculated by two different methods—the Italian and the Gregorian. By the former method the solar year is supposed to consist of 365 days, the lunar of 354 days; the difference in one year is therefore 11 days, in two years 22 days, in three years 33. When the difference exceeds 30 days an intercalary lunar month of 30 days is added to the lunar year, which then consists of 13 months, the remaining difference being 3 days. To this 11 is added, again making 14 days. This addition of 11 days, with deduction of the even 30's to form intercalary months, is continued for a cycle of 19 years, giving the following series of epacts: 11, 22, 3, 14, 25, 6, 17, 28, 9, 20, 1, 12, 23, 4, 15, 26, 7, 18, 29. As the next epact would give 10 instead of 11 one more is added to recommence the cycle, making the 20th epact 12 instead of 11, and then the series proceeds as before. In using this cycle one day must be added to the lunar month in leap-years, in which the 29th day of February is included. The lunations are supposed to consist of 29 and 30 days alternately, with the exception of the intercalary lunations, which all consist of 30 days, with one of 29 days at the end of the cycle, that is, instead of making the 20th epact 12, and deducting 30, as explained above, the intercalary month at the end of the cycle may be made 29 days and the epact 11 as formerly. The number of any particular year in this cycle is called its *Golden Number*. As the cycle is supposed to commence with a year in which the new moon falls on the 1st of January, which makes the cycle begin one year earlier than the commencement of our era, by adding 1 to any year of the vulgar era and dividing the sum by 19, the quotient will give the number of cycles elapsed from the beginning of the Christian era, and the remainder the Golden Number of that year. If there is no remainder the year will be the 19th or last of the cycle. The new moons by this calendar sometimes differ from the real new moon by as much as 2 days. The Golden Numbers are marked in the calendar by Roman letters. The use of this cycle requires corrections both for the lunar and the solar year. Hence a new calendar was constructed by Luigi Lilio (Aloysius Lilius), called the Gregorian Calendar of Epacts. It fixes the epacts for an indefinite period without regard to natural phenomena.

EPAMINONDAS, a Theban hero, who, for a short time, raised his country to the summit of power and prosperity. He was born about 418 B.C., and was descended from a noble family, but was reared in poverty. Throughout life he was distinguished for the friendship subsisting between him and Pelopidas, which is supposed to have originated in a campaign in which they fought together for Sparta against Mantineia. He was sent to Sparta B.C. 371 to represent Thebes in negotiating a peace with the Athenian envoys. As the Spartans refused to recognize Thebes as the representative of Bœotia, the Thebans were excluded from the peace. Cleombrotus was sent by the Spartans to invade Bœotia, but was defeated at Leuctra (B.C. 371), chiefly through the tactics of Epaminondas. Two years after Epaminondas and Pelopidas were made Bœotarchs. They invaded Peloponnesus together, detached several nations from the alliance of Lacedæmon, and delivered the Messenians, whose capital they rebuilt. Epaminondas then marched with his army to Sparta; but this city was so bravely and skilfully defended by Agesilaus that the Theban hero, finding winter approaching and the Athenians now in declared hostility with Thebes, evacuated Laconia, after laying waste the low country. An accusation was brought against him on his arrival in Thebes, because he and Pelopidas had kept the Bœotarchate beyond the legal time; the accusation was literally true, but the infringement of the law was justified by his services, and after having pled his own cause, he was acquitted. In 368 he again invaded the Peloponnesus, and although opposed by the allied forces of Sparta and Athens, he compelled Sicyon and Pellene to relinquish the Lacedæmonian alliance, but was repulsed in an attack on Corinth. In the same year he served in a Theban army sent into Thessaly to rescue Pelopidas, who was kept a prisoner at Pheræ, and in the following year he commanded an expedition with the same object which was successful. In 366 he again invaded the Peloponnesus, but the fruits of this invasion were lost by

political intrigues, and in 362 he was compelled again to make head against a formidable coalition of states, including Athens and Sparta. His tactics were never more brilliant and successful than in this campaign, but in the battle of Mantineia, fought the same year, he was killed at the moment of victory.

EPAULETTE (the French diminutive of *epaule*, shoulder), signifies a military ornament worn on the shoulder, and of which the form, material, place, and number serve to distinguish the rank of the wearer. Epaulettes are of wood, silver, or gold. Sometimes one is worn and sometimes two, according to rank. Their origin has been traced to the knot by which the various pieces of the armour were attached to the shoulder. In the French service the epaulette was made a regular part of the uniform by an ordinance of 1759. Epaulettes were worn in the British army till 1855. They are still worn in the navy, and by some civil officers. In the navy the different ranks of the wearers are distinguished by crowns, anchors, stars, &c., worked in silver on the epaulette.

EPÉE, CHARLES MICHAEL, ABBE DE L'. This benefactor of the deaf and dumb was born in 1712 at Versailles. He had chosen the clerical profession, but being unwilling to subscribe to the formulary of faith introduced on the occasion of the Jansenist controversy, he devoted himself to law for a while, but was afterwards preacher and canon at Troyes. The idea of bestowing on the deaf and dumb the advantages of society, by means of a language of signs, was not first conceived by him (see DEAF AND DUMB), though, according to his own account, it arose in his mind without any foreign suggestion, and accordingly he was, in some measure, the inventor of this mode of instruction, which he first tried on two sisters, and found his efforts so successful that he resolved to devote his life to the business. This noble-spirited man was a true father to the unfortunate, for whom he established an institution at his own expense. He spent his whole income, besides what was contributed by benevolent patrons, such as the Duke of Penthièvre, in the education and maintenance of his pupils, for whose wants he provided with such disinterested devotion, that he often deprived himself of the necessaries of life. Notwithstanding his efforts, he never could accomplish his favourite project, an institution for the deaf and dumb at the public expense, which was first obtained by his successor, the Abbé Sicard, who has much improved the mode of instruction. He died in 1789, leaving several writings on the instruction of the deaf and dumb, and the method pursued by him.

EPERIES, a town, Hungary, capital of the county of Czaros, in a beautiful district on the Tarcza, 140 miles N.E. of Pesth. It is walled, and consists of the inner town, which is well built and has one very fine main street, and of two large suburbs. It is the seat of a bishop's see, and of several courts and public offices, and contains a Protestant and four Roman Catholic churches, a town-hall, a Protestant college, and a Roman Catholic gymnasium and high school, manufactures of woollen and linen cloth, delft-ware, &c., and a considerable trade, particularly in linen. Pop. 10,772.

EPERNAY, a town of France, department of the Marne, on the Marne, 20 miles E.N.E. of Châlons, with 11,704 inhabitants, is the central depôt of the wine trade of Champagne. In the cellars of the town about 5,000,000 bottles of wine are stored annually, of which 800,000 are the produce of the territory of Epernay. There are manufactures of corks, barrels, &c., connected with the wine trade. The vast cellars form a labyrinth of galleries cut in the tufa or calcareous soil of the district.

EPHEMERIDÆ, a family of Neuropterous insects, so named from the extreme shortness of their adult life, which is devoted to reproduction. The family is characterized by the slenderness of their bodies; the delicacy of their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the abdomen in three filiform appendages. The adult *May-flies*, or *day-flies*, emerge from the chrysalis on the banks of the running streams in which the eggs were hatched, and, appearing usually towards sunset, are no less remarkable for their great activity than for their enormous numbers; though the latter appears greater than it really is, since the adults are unfit for reproduction till after the second moult, the very perfect sloughs thus being doubled in a few hours. The eggs, which are shed in a mass, drop into the water; the larvæ have elongated depressed bodies; eyes lateral, no ocelli; setose antennæ, and long caudal filaments; and lamellar or tufted gills, symmetrically disposed on either side of the abdomen. They remain in the water for a year or two before undergoing further change, lying beneath stones, and leading a predaceous life, for which their strong jaws fit them. The rudiments of wings mark the commencement of the nymph stage, at the close of which they crawl out of the water, and cast the nymph integument. Their sexual immaturity prior to the second moult has led to their being named, at this stage, subimagos or pseudimagos. The larvæ, which are very similar throughout the family, are largely used as bait. *Ephemera* and *Cœnis* have three caudal filaments; *Palingenia* and *Cloë* only two, but the larvæ have three. The posterior wings are absent in *Cloë* and *Cœnis*. The family is widely distributed, and in some seasons or localities they are so numerous that the bodies have been used as manure.

EPHEMERIDES, tables showing the places where all the planets are found at noon of every day. It is from these tables that the eclipses, conjunctions, and aspects of the planets are determined, horoscopes constructed, &c.

EPHEMERIS, an astronomical almanac. See ALMANAC (NAUTICAL).

EPHESUS, a Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth. It was the grand emporium of Western Asia, having a convenient and spacious harbour. The city was said to have been founded by the Amazons, and was first inhabited by the Carians and Leleges, but afterwards taken possession of by the Ionians. It afterwards fell successively under the dominion of the Lydian and Persian kings. Its importance as a commercial city dates from the time of Alexander. The Apostle Paul visited Ephesus and established a Christian church there, to which he dedicated one of his epistles. It was famous for its temple of Artemis (Diana), called *Artemision*, situated between the town and the harbour, and reckoned one of the seven wonders of the world. The temple was of the Ionic order. It is said that 220 years elapsed before the completion of this edifice, which was 425 feet long and 220 broad, and was adorned with 127 pillars, each 60 feet high, and with numerous statues and paintings of the most celebrated Grecian masters. It had been destroyed seven or eight times before Pliny wrote, particularly by the notorious Herostratus, 356 B.C., whose only object in burning the temple was to perpetuate his name. The temple, however, was rebuilt with more magnificence than ever by the Ephesians, whose women contributed their trinkets to the general fund raised for this purpose. Its ruins are now the residence of cowherds and their

cattle, and the once splendid city is a poor village called *Aiasoluk*.

EPHOD, a species of ornament worn by the Jewish priests. That of the high-priest formed a rich covering of gold, blue, purple, and crimson cotton cloth, with a breastplate attached to it, consisting of two large precious stones, on which the names of the twelve tribes were engraven. That of the other priests consisted only of plain fine linen.

EPHORI, a species of magistrates common to many Dorian communities, of whom the most celebrated were the Ephori of Sparta. The origin of the Ephori is not known, but their office in Sparta served as a counterpoise to the king and council. Their number was five. They were elected by the people without restriction as to qualifications. They entered on office after the autumnal solstice. They superintended the morals and domestic economy of the community. They scrutinized the conduct of all magistrates, including the kings themselves, who, in course of time, fell completely under their control. Cleomenes murdered the Ephors for the time being, and abolished the office, B.C. 225. It was restored by the Romans.

EPHRAEM SYRUS, theologian, was a Syrian, born at Nisibis about 325, died at Edessa in 373 or 378. He devoted himself to a monastic life, and constantly refused preferment, but after settling in Edessa (about 365) he was ordained a deacon. He knew no language but the Syrian, but was a fertile writer on theological and moral subjects, a controverter of heresy, as well as an exhorter of the faithful. His works have been published in Syriac, Greek, and Latin. They were collected by Gerard Voss, who published them in Latin at Rome, Cologne, and Antwerp, from 1589 to 1619. Besides theological and moral treatises, they contain numerous homilies, and a large number of hymns designed to supersede others of a heretical character, are also attributed to him.

EPIC, a poem of the narrative kind. This is all that is properly signified by the word, although we generally understand by it a poem of an elevated character, describing the exploits of heroes. Without entering into the various theories of epic composition, we shall state the views of one of the most distinguished critics of our age—A. W. von Schlegel—on this subject. As action is the object of the drama, so narration is that of the epic. But as the event related is something already past, the epic is less stirring than the drama, which represents an action as just happening, and therefore fills the mind with a lively excitement; hence the more quiet tone of the epic, and the pauses which may be allowed in the interest of the description, whilst the character of the drama is to set before the spectator a rapid succession of actions, and completely engross him in the exhibition; hence, too, the poet is allowed to introduce passages of philosophical reflections (the frequency and propriety of which, of course, must be regulated by the taste and judgment of the writer); nay, the very epithets by which the persons and events of the epic poem are designated are of a descriptive character, and indicate the poet's observation of what is going on; whilst in the drama he must not make himself visible at all. The epic is not a hasty journey, in which we hurry towards a certain end, but an excursion, on which we take time to view many objects on the road, which the art of the poet presents to amuse us. Jean Paul Richter, in his Vorschule der Aesthetik (Introduction to Æsthetics), says on this point: 'The epic poet may fly from region to region, between heaven and hell, but he must, at least, describe his flight and his way. Slow and prolonged description is allowed in the epic. Hence the propriety of a calm and minute description of the shield of Achilles; hence the propriety of the episode. The multitude of actors retards, like a number of wheels in clockwork, the course of the machine; since each actor requires room for his action. Novels are epic compositions, and follow the same rules. Yorick's journey occupies but three days; the fifth book of Don Quixote is confined to one evening in a tavern. The action of the poem becomes tedious, it is true, in case of repetition, and stops when action foreign to the main purpose is introduced; but the main action of the poem may be divided into parts without being exposed to the charge of these faults, as the unity of a day is not destroyed by its division into hours.' Unity, indeed, is necessary in the epic as in every poem, and, in fact, in every production of art. But this unity need not be so scrupulously observed as in the drama. A writer of genius may be allowed to overstep the rules, and say, 'I do not intend to give you a perfect epic, but merely fragments,' as Byron has done in the case of the Giaour. Such productions, however, must always remain exceptions to the class of epic compositions.

From what has been said, it appears that the epic may treat of very different subjects, grave and elevated like Dante's and Milton's poems, glowing and romantic like Ariosto's and Wieland's epics, cheerful and ludicrous like Tassoni's and Butler's admirable productions. Accordingly, epics have been divided into heroic; mock-heroic, as Pope's Rape of the Lock, or La Secchia Rapita (The Rape of the Bucket), or Boileau's Lutrin; romantic, as Tasso's Jerusalem Delivered; allegoric, as Dante, &c.; but these divisions can never be very definite, as they pass imperceptibly into each other. Whilst Homer is, we might almost say, plastic, Ariosto is almost lyric, and always descriptive in quite another style, and Milton often pours forth his religious sentiments in a lyric strain; yet the poems of all are epics.

Among the modern languages of Europe, none is so well adapted to description as the English—a circumstance to which, probably, is partly owing the great number of English epics, or poems of an epic character, of which many are truly beautiful, including all varieties, from the sublimity of Paradise Lost to the wit of Hudibras. Spenser, Milton, Glover, Butler, Pope, Scott, Byron, Moore, Campbell, Southey, and many other distinguished names, are embraced in the list of English epic writers.

In the number of good epics, however, the Italians excel the English, and can produce three, at least, of the highest character, while the English have but one of the highest rank to oppose to them: these three are Dante's Divina Commedia, one of the grandest productions of the human mind; Ariosto's Orlando Furioso, the flower of romantic poetry; and Tasso's Gerusalemme Liberata, a poem which, if less spirited and original than Ariosto's, abounds in narrative interest, and cannot be surpassed in sweetness and harmony. The Italians are very rich in burlesque and satiric epics.

The Germans possess one great ancient epic, the Nibelungenlied, a poem of the grandest design, and of the highest rank in regard to the characters described, excelling in this respect the Iliad of Homer; the chief personage of which is violent, self-willed, and incapable of self-government, so as to fall far below the rank of a true hero, whose attributes should be firmness and self-command, a spirit unshaken in adversity, and an intellect adequate to every exigency. But, in respect to poetical execution and beauty of language, the Nibelungenlied cannot be compared with the Ionic rhapsodies. Of a very early date, likewise, is the satirical epic Rey-

nard the Fox, a poem alike original in design and execution, in well-conceived and well-executed satire. It may be considered a model of satiric epic poetry. The greatest modern epic of the Germans is the Messiade, by Klopstock, which we consider faulty in its very conception, as the life of the Saviour offers but little matter suitable for the epic poet, so that the poem, in general, has little of an epic character. It is not much read in Germany; when perused, it is generally as a task, and from a feeling of duty. In modern times the Germans have had several epics from Wieland, Schultze, and others; but he who has enjoyed Camoens, Ariosto, and the epics of the British poets, will not think that the German epics rise in value by comparison: still less should we think of extolling those German epics which partake more or less of the character of idyllic poetry; and the most celebrated of which is Goethe's Hermann and Dorothea, a poem much esteemed by his countrymen in general (but in which we were never able to take any great interest), giving quaint descriptions in incorrect hexameters: it must be remembered, however, that, when this poem was written, hexameters, in German, were something new, and the standard of correctness had then not been raised so high as it has since been, chiefly by the exertions of A. W. von Schlegel. Still less could we ever relish the Louisa of Voss, a poem which treats in regular epic style the scenes in the life of a country clergyman, and in which the standing epithet *ehrwürdig* (venerable) is as often and gravely repeated whenever 'the pastor of Grunau' is mentioned, as *swift-footed*, in Homer, with the name of Achilles. Descriptiveness is not so prominent a feature in the German language as in the English, and therefore it does not so naturally lead to epic poetry.

The most important epic of the Spaniards is Ercilla's Araucana, a poem, which to foreigners generally appears like a dull chronicle, defective in poetical conciseness of language and originality of ideas. The Spaniards possess several epics of an allegoric-religious character.

One of the noblest of epic productions is Camoen's Lusiad, which, like a magnificent flower, sprung naturally out of a heroic and glorious age, and which, in spite of the many animadversions on particular parts of it, in which the taste of the age may have prevailed over the higher claims of poetry, will be prized as long as noble ideas and beautiful descriptions are valued.

The French language, the chief traits of which are precision, and an agreeable and often charming vivacity, is not very well adapted for the epic, which, not to become tedious in the slow progress of the narrative, requires a copious and descriptive language: qualities for which the French language is by no means remarkable. The Henriade strikes most foreigners as a failure, in which the author's intellect is more conspicuous than his poetical genius. Boileau's comic epic, the Lutrin, is much admired. The difficulties of the French language as a poetical medium have led many of its most distinguished writers to prefer prose to verse in works of imagination. Hence a series of works such as Fénelon's Télémaque, Marmontel's Incas, St. Pierre's Paul et Virginie, and many others, which, though less regular in form than the pure epic, are quite distinguished from the common novel or ordinary prose fiction, and may be considered as a distinct class of prose epics.

Of the Greek epics, it is well known that Homer's Iliad and Odyssey are the principal. Much the most distinguished Roman epic is the Æneid of Virgil. Lucan's Pharsalia is rather a historical chronicle than an epic. It is intended as an apotheosis of Pompey. The licentious Petronius also wrote an epic on the civil wars of Cæsar and Pompey. Valerius Flaccus, contemporary of Vespasian, wrote an epic on the Argonauts, too close an imitation of the Argonautica of Apollonius Rhodius. There are, however, some noble passages in Valerius Flaccus. Silius Italicus wrote an epic on the second Punic war. Statius, contemporary of Domitian, is the author of the Thebaid, which he dedicated to this corrupt tyrant. His style is bombastic and affected; but he is a writer of genius. Dante acknowledges this in his poem.

EPICHARMUS OF COS, a Greek philosopher of the Pythagorean school, born at Cos about 540 B.C., lived in the early part of the fifth century before Christ, at Syracuse, and there wrote his celebrated comedies, now lost. Their number is reckoned at fifty-two, and the titles of forty of them have been preserved. Before commencing his career as a comic poet, which he did somewhat late in life, he lived at Megara, engaged in the study of philosophy, both physical and metaphysical. The fragments of his poems which are preserved exhibit the results of this course of study. They abound with philosophical maxims, and with speculative discourses. His genius was highly esteemed among the ancients by such judges as Plato and Cicero. The Sicilian comedy of Epicharmus, prior to the Attic, grew out of the mimes, which were peculiar to this island, making a sort of popular poetry. He arranged the separate unconnected scenes, exhibited in the mimes, into continued plots, as in tragedy. His comedies were long regarded as models in this species of composition, and were as much distinguished by their knowledge of human nature as by their wit and lively dialogue. The Sicilian comedy, in opposition to the Attic-Ionic, is also designated as the Doric comedy. He died B.C. 450, about ninety years of age.

EPICTETUS. This celebrated Stoic was born at Hierapolis, in Phrygia, about A.D. 60, and lived at Rome, where he was the slave of Epaphroditus, a brutal freedman of Nero, whose abuse and mal-treatment he bore with fortitude. Epictetus himself did not leave any written account of his doctrines, which appear to have been of the most elevated kind. In his discourses he aimed to impress his hearers with the love of practical goodness. He did not despise knowledge, but considered it as a means to an end. The foundation of philosophy he held to be the perception of one's own weakness and inability to do what is needful. From this arises the study of philosophy to discover a standard of good and evil. The philosopher he considers the messenger of Zeus to correct the erroneous notions of men on these subjects, and lead them back to themselves. His doctrines approach more nearly to Christianity than those of any of the earlier Stoics, and although there is no trace in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. (See Dr. Smith's Dictionary of Greek and Roman Biography and Mythology.) The excellence of his system was universally acknowledged. Domitian banished him with other philosophers from Rome; for the tyrant could not but hate men whose principles breathed scorn of all injustice and wickedness. Epictetus settled in Epirus, and although he possessed the favour of Hadrian, there is no evidence that he returned to Rome. Arrian collected the sayings of Epictetus, his teacher; we have them still under the title of Enchiridion. Besides this manual we have four books more of philosophical maxims by him. Of both works, especially of the Enchiridion, there have been many editions. Schweighäuser has published them together (Leipzig, 1799, seqq. five vols.)

As a proof of the high respect in which Epictetus was held, it is said that his study lamp was sold after his death for 3000 drachmas.

EPICUREAN PHILOSOPHY. See EPICURUS.

EPICURUS, the founder of a celebrated philosophy, was the son of Neocles and Charestrata of Gargettus, whence he is sometimes called the Gargettian. He was born in the island of Samos, B.C. 342, and spent there the first eighteen years of his life. He then repaired to Athens (B.C. 323), where he is said to have enjoyed the instructions of Xenocrates, then at the head of the Academy, but this he himself does not admit. Epicurus generally denied his obligations to other philosophers. Although some parts of his system are evidently borrowed from his predecessors, he claimed to be self-instructed, and treated his teachers with hostility and contempt. His stay at Athens, however, was brief; and on leaving it he went to Colophon, where his father was engaged in teaching, and began himself to give lessons in grammar. It was here, according to some accounts, that his attention was first turned to philosophy. He himself says he began his philosophical studies at the age of fourteen, but they may have subsequently taken a more distinct development. The inability of the grammarians to explain a passage about Chaos and the accidental possession of a copy of the works of Democritus are variously assigned as the cause of this new or more decided direction of his mind. From Colophon he went to Mytelene and Lampsacus, where he engaged in teaching philosophy. He returned to Athens B.C. 306, and purchased a garden in a favourable situation, where he established a philosophical school. Here he spent the remainder of his life. His mode of life appears to have been simple and temperate. He abstained, as a principle, from politics, and took no part in public affairs. During the latter part of his life he was afflicted with severe physical suffering. For many years he was unable to walk, and about a fortnight before his death his maladies were aggravated by the formation of stone in his bladder, which brought his life to a close amid acute suffering at the age of seventy-two, B.C. 270. All this was borne with heroic courage and constancy.

The pupils of Epicurus were numerous, and they were enthusiastically devoted to him. This is probably to be ascribed, in part at least, to the kindness of his natural disposition, and the attachment he always manifested to his friends. His philosophical doctrines were also followed by his leading disciples with scrupulous exactness, so that the Epicurean philosophy may be said to be contained entirely in the doctrines of Epicurus. Epicurus, as already observed, claimed to have arrived at his philosophy as the result of independent thought and investigation. He, however, adopted both in his physical and ethical theories some of the fundamental positions of his predecessors. Even assuming his claim to be well founded, this was, indeed, inevitable. He is said in some things to have misunderstood the views of Democritus and Diagoras, from whom he borrowed the atomic theory of the physical universe. This may, perhaps, show that he had never formally studied them, and that he formed his system only from such an incidental knowledge of them as an intelligent man must have of the current theories of his day. Like Democritus he derives all material forms from a concourse of atoms or minute particles of matter. We derive our conceptions of things from eidola or images reflected from the things themselves. Even the gods are atomic, and our knowledge of them, as of other things, is ideal. The ethical system of Epicurus, which formed the culminating point of his doctrine, was, like his physical system, based on a principle already promulgated, but developed independently of the views of his predecessors. Its fundamental maxim was that of the Cyrenaic school, that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He differed from the Cyreneans, however, in giving, or endeavouring to give, a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented, but while it is not open to the charges of gross sensualism which have been brought against it, and which are more justly chargeable on the earlier Cyrenaic school, it cannot be considered as much better than a refinement of sensualism. The atomistic theory, as developed by Epicurus, has been charged not unjustly with atheistic consequences, and if the faith in virtue displayed in his ethical system may be supposed to indicate a higher origin, the virtue itself which Epicurus exalts may very well be called in question. When once the position is laid down that virtue consists in the pursuit of pleasure, there does not appear to be any effective answer to those who would place it in the pursuit of more active pleasures than Epicurus recommends. Thus his doctrine, however he may have meant it as an instruction in the superiority of moderation and virtue, is justly liable to the charge of placing the preference of virtue on too feeble a foundation, and of opening a wide door to all manner of abuses.

Epicurus was a very voluminous writer. His works, however, are represented as full of repetitions and quotations. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both. This is easily comprehended, as it was in fact a system engendered by the decline of public virtue in Greece, while the severest stoical philosophy was better adapted to the still active public spirit of Rome. In the Epicurean system, there are, as will be observed, strong points of resemblance with many modern systems, and many modern works of controversy have been written directly on the Epicurean system. Little is left of the numerous writings of Epicurus. Some fragments of a Treatise on Nature have been found at Herculaneum, and published by Orelli (Leipzig, 1818). The other accounts of his philosophy are the poem of Lucretius, four epistles and forty-four propositions containing the substance of his ethics preserved in Diogenes, the notices of it in Cicero, Pliny the elder, &c. Two of his letters, under the title of Epicuri Physica et Meteorologica duabus Epistolis Comprehensa, are published by J. G. Schneider (Leipzig, 1813).

EPICYCLE, in the ancient astronomy was a subordinate orbit or circle, which was supposed to move on the circumference of a larger one called the *different;* by means of which one motion, apparently irregular, was resolved into two that were circular and uniform. And when the observed motion was so irregular and complicated as not to be resolved with one epicycle, others were added, till a nearer approximation was obtained. This system owed its origin to a prejudice that seems to have been extremely ancient, in favour of circular motion; and the problem that principally engaged the attention of astronomers in those times was to assign the proper proportion of the *different* and epicycle which

should approximate nearest to absolute observation. See ASTRONOMY—History of.

EPICYCLOID, in geometry, is a curve generated by a point in one circle, which rolls on the circumference of another circle, either on the concavity or the convexity, and it thus differs from the common cycloid, which is generated by a point in a circle that rolls along a right line. The latter has sometimes been assimilated with the former, by copsidering the right line as the circumference of a circle whose diameter is infinite. The invention of epicycloids is ascribed to M. Roemer, the celebrated Danish astronomer.

EPIDAURUS, one of the most considerable towns and commercial seaports of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple of Æsculapius, which stood on an eminence not far from the town. An inscription over the entrance declared it to be open only to pure souls. Crowds of invalids resorted to the place in hopes of obtaining a cure from the beneficent divinity, in whose honour festivals were celebrated yearly.

EPIDEMIC, or EPIDEMIC DISEASE (from *epi*, and *demos*, among the people), signifies a state of sickness which prevails in a place or tract of country only for a temporary period. An epidemic always originates in transient external influences, which gradually produce such changes in the bodily system as finally bring on the sickness. Thus many diseases appear to arise from some peculiar morbid matter in the atmosphere, brought by particular winds; for example, the influenza, and other diseases: also poor or scanty food, unwholesome mixtures, &c., may occasion epidemics. Seasons of scarcity, which compel men to have recourse to unusual means of subsistence (as, for example, in Norway and Sweden, to the bark of trees instead of corn), often occasion epidemics. The ergot in rye is supposed to be the cause of *raphania*. Bad barley, or much mixture of bearded darnel (*Lolium temulentum*), makes the beer which is prepared from it unwholesome, and produces sickness in those who partake of it. Causes producing a disturbed state of mind, such as war, sieges, earthquakes, &c., by their effects on the nervous system, may very much favour the production of epidemic diseases, or at least render them more malignant. Epidemics sometimes begin with a few, sometimes attack great numbers at once, as commonly happens in a great and sudden change of wind or weather. If, for instance, after a long continuance of a west or south-west wind, with warm weather, it suddenly changes to an east or north-east wind, we hear people complaining directly of coughs, colds, rheumatisms, &c. An epidemic, at its commencement, is usually mild, and becomes more dangerous as it spreads; as it goes off, it, for the most part, assumes a mild character again. It frequently terminates as gradually as it began, but sometimes suddenly. Many persons are not at all affected by the prevailing epidemic. The cause probably lies in their bodily habit, which is opposed to the prevailing influences, and makes them capable of resisting them longer than other persons. Thus it often happens that men with chronic complaints, hypochondriacs, &c., remain free from epidemic disorders. Epidemics are often confounded with contagious disorders. The first originally are not contagious; their origin and propagation depend on general influences, and they commonly generate no contagious matter, producing the same disease in another body by contact with it. It is only in particular circumstances, especially if the disorder is a violent one, and many patients are crowded into a narrow room, that a contagious matter can be generated, forming a corrupt atmosphere about the sick, and capable of exciting the disease in persons who come near it. Even under these circumstances, contagion does not necessarily take place, and the ignorant generally conceive a hasty and groundless fear of contagion. Thus, for instance, that is frequently ascribed to contagion which is only the consequence of a violent shock of the nervous system at the sight of a sick person, whereby the disease, to which the body was already disposed, is more quickly developed.

EPIDERMIS (from *epi*, upon, and *derma*, the true skin), the scarf-skin. See CUTICLE and SKIN.

EPIDOTE. This mineral is found crystallized in rhombic prisms variously modified, both laterally and at its extremities. It cleaves parallel to the sides of a right-oblique-angled prism of 115° 36′, and 64° 24′, which is therefore its primary crystal. Some of its more interesting secondary or actually occurring forms are the following, viz.: 1, the primary crystal, altered by the truncation of its acute lateral edges, and terminated at both extremities by dihedral summits; 2, the same, but terminated by four-sided pyramids, whose apices are truncated; 3, the primary crystal, with all its lateral edges truncated and terminated as in the last instance. The prisms are generally striated longitudinally; lustre, vitreous; colour, green and gray prevalent. Among the most common shades of the first is pistachio-green; the gray colours pass into white; translucent on the edges, and sometimes transparent; brittle; hardness, above that of felspar, and little inferior to quartz; specific gravity, 3·26 to 3·42. Some of the larger crystals from Norway consist of concentric coats, the outer ones of which, being peeled off, leave a crystal with smooth faces. Twin crystals are often observable. When massive, the individuals are columnar, straight, and either parallel or divergent; they are sometimes granular, and even become, occasionally, impalpable, when they are strongly connected. The deep green varieties are called, in common language, *epidote*, while the gray are denominated *zoisite;* some mineralogists consider that no distinction exists between the two, except what arises out of colour, while others maintain that they are different, since their crystalline forms do not coincide in any particular. The granular variety has also been distinguished by the separate appellation of *scorza;* and a light reddish-black variety from Piedmont, which is highly charged with oxide of manganese, has been called the *manganesian epidote*, the bright red from Glencoe, in Scotland, being termed *withamite*. Another species, allanite, contains the rare elements, cerium, lanthanum, and yttrium. The chemical composition of epidote is as follows, the specimen analyzed consisting of the green variety from Norway: silica, 37; alumina, 21; lime, 24; oxide of iron, 15; oxide of manganese, 1·50. Before the blowpipe this species melts, with much intumescence, into a greenish transparent glass, and gives a deposit of moisture. This water seems a regular constituent. . It is not easily acted on by acids, but after ignition it gelatinizes. Epidote is found in the oldest rocks, in which it occupies drusy cavities, or narrow veins, being irregularly distributed through them, without ever entering into their composition, as a regular ingredient. Magnificent crystals of it, 2 or 3 inches in length, and 1 or 2 in diameter, are found at Arendal in Norway, and are hence called *Arendalite*. Similar varieties occur in Sweden, and at Franconia, New Hampshire. Finely crystallized specimens come from Piedmont; and the zoisite variety is found in the Tyrol, and in a great number of places in the United States. The transparent crystals, of a fine colour, are sometimes wrought by the lapidary; though they are esteemed of little value in jewelry.

EPIGASTRIC (*epigastricus*, from *epi*, upon or above, and *gaster*, the stomach). That part of the abdomen that lies over the stomach is called the *epigastric region*. It reaches from the pit of the stomach to an imaginary line above the navel, supposed to be drawn from one extremity of the last of the false ribs to the other. Its sides are called *hypochondria*, and are covered by the false ribs, between which lies the *epigastrium*.

EPIGENESIS. What evolution is for the changes that take place throughout nature, epigenesis is in the development of the ovum. The generative stimulus is followed by growth of the protoplasm of the ovum and its differentiation, so that the homogeneous material passes through the stages briefly described in the article EVOLUTION. There is a gradual specialization of parts, whereby the homogeneous matter assumes the successive complications of an organized body. There is no speciality of the protoplasm, save that it is present in organs which place it under the most favourable conditions for the kind of development which results in the formation of a new individual.

EPIGLOTTIS (from *epi*, upon, and *glottis*, the mouth of the windpipe), the cartilage at the root of the tongue that falls upon the glottis or superior opening of the larynx or upper part of the windpipe. Its figure is nearly oval; it is concave posteriorly, and convex anteriorly. Its apex or superior extremity is loose, and is always elevated upwards by its own elasticity. While the back of the tongue is drawn backwards in swallowing, the epiglottis is put over the aperture of the larynx; hence it shuts up the passage from the mouth into the larynx. The base of the epiglottis is fixed to the thyroid cartilage, the os hyoides, and the base of the tongue, by a strong ligament.

EPIGONI, in ancient Greek legend, the collective name of the sons of the seven Greek princes, who conducted the first war against Thebes, without success. The name signifies *after-born*, or *successors*, from *epi*, and *gignesthai*, to be born. See THEBES.

EPIGRAM (from *epi*, upon, and *graphein*, to write), originally an inscription, then a poetical inscription in temples, on tombs, &c. The object requires brevity, but admits of all kinds of sentiments and ideas; and it is a great mistake to suppose the epigram always satirical. From its concise and expressive character it is, indeed, well fitted for satire, and often employed for satirical purposes, as it was, likewise, with the Romans; but an epigram may be didactic, satiric, comic, lyric, or elegiac. Lessing, in his Theory of the Epigram, says that it is made up of two parts—of an interesting idea and a striking conclusion; but Herder has shown that this is not the essential character of the epigram, though a frequent and agreeable form. It was not, by any means, generally the case with the Greek epigrams. The epigram, with the Romans, flourished most, as was natural, in corrupt times, when satire found most occasion for reproach, and wit took the place of noble ideas. Catullus and Martial were distinguished epigrammatic poets among the Romans. Marot, in the time of Francis I., Piron, J. B. Rousseau, Lebrun, Boileau, and Racine, are distinguished in this department among the French. The most piquant epigrams of the Romans and French are often the most licentious, and offend as much by their indelicacy as they divert by their ingenuity. The tender and pathetic epigram of the Greeks has been supplied by the madrigal among the Italians, Spanish, Portuguese, and French. The French have distinguished themselves beyond most nations in epigram. Among English poets, Burns and Byron are celebrated for the number of their epigrams.

EPIGYNOUS (Greek, *epi*, upon, *gynē*, a female), in botany, is the epithet applied to the outer whorls of a flower, particularly the stamens, to indicate that they are inserted upon the ovary.

EPILEPSY (in Greek, *epilepsis;* from *epilambano*, to seize upon), a nervous disease, depending on various causes, often exceedingly complicated, and incapable of being removed; hence so often an incurable periodical disease, appearing in single paroxysms. Among the different causes may be mentioned hereditary tendency, gastric disturbances either from indigestion or the presence of worms, or some irritation within the skull itself, such as tumours, &c. It is, for the most part, preceded by a cold vapour (*aura epileptica*), creeping up from the foot or hand to the breast and head, or some other premonitory symptom, such as spectral illusions, headache, giddiness, confusion of thought, sense of fear, &c.; but sometimes there are no precursive symptoms. The patient suddenly falls, commonly with a cry, the thumbs are convulsed, other parts are agitated more or less, entire insensibility succeeds, the breath is short and quick, broken, and accompanied with groans, the mouth foams, the tongue protrudes, is often severely bitten, the face becomes livid, and is convulsed, the teeth gnash together, the eyes are distorted, the urine and other evacuations are discharged involuntarily, the eyes are wide open and staring, and insensible to the light. The paroxysm is usually over in two or three minutes. The patient awakes as from a deep sleep, entirely unconscious of what has passed; he feels nothing unpleasant, except fatigue, and a little pain in his limbs. Sometimes the paroxysms occur nine or ten times in an hour, or oftener; sometimes only once a month, at the change of the moon, or every six months, or at still longer periods. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself; and this is to be accomplished by laying him on the floor or on a large bed, by raising the head gently and loosening all tight parts of the dress. It is also advisable to protect the tongue from being bitten by introducing a piece of india-rubber, cork, or soft wood between the teeth. All other attempts, such as forcing open the thumbs, and the like, are of no avail, except to terminate the paroxysm sooner, but, at the same time, occasion a quicker return of it, and render the disease more difficult to cure.

EPILOGUE (from the Greek *epi*, and *logos*, word, speech), the closing address to the audience at the end of a play. The epilogue is the opposite of the *prologue*, or opening address. Many of Shakspeare's plays have an epilogue as well as prologue, in which the poet sometimes craves the indulgence of the spectators for the faults of his piece and the performance, and sometimes intimates in what light his work is to be considered. The epilogue is sometimes a necessary appendage, to tell us something of a composition, which cannot be gathered from the composition itself. It is very difficult to prevent prologues and epilogues from sinking into mere commonplaces, and from injuring rather than aiding the play.

EPIMENIDES, a celebrated philosopher and poet of antiquity, who was born in Crete, in the seventh century before Christ, and spent the greater part of his life at Cnossus. By some he is reckoned among the seven wise men, instead of Periander. Most of the stories told of him are mythical. He is represented as favoured with divine communications, and as an infallible prophet. When the Athenians were visited with war and pestilence, and the oracle declared that they had drawn on themselves the divine anger by the profanation of the temple, in which the followers of Cylon had been put to death, and must expiate their offence, they sent for Epimenides, who was

renowned for his wisdom and piety, from Crete, to purify the temple. On his departure he refused to accept any presents, and only asked the friendship of the Athenians on behalf of Cnossus. There is a story of his having, when a boy, slept in a cavern for fifty-seven years. On awakening, he found, to his astonishment, everything changed in his native town. This story is the ground-work of Goethe's poem, the Waking of Epimenides, for the anniversary of the battle of Leipzig. According to some accounts he is said to have lived for upwards of 150, according to others for nearly 300 years. He is supposed to be the prophet referred to by St. Paul in Titus, ch. i. 12.

EPIMETHEUS, in Greek mythology, a son of Iapetus and Clymene, and the brother of Prometheus, against whose advice he married Pandora, who opened the box in which the foresight of Prometheus had hid all the ills by which mortals were liable to be afflicted. All kinds of diseases and torments issued out of the box, and hope alone remained behind. According to other accounts it was Epimetheus himself who opened the box. (See PANDORA.) It is to be remarked that, in the Greek tradition, curiosity and disobedience are made the origin of evil, as in the Mosaic account of the fall.

ÉPINAL, a town, France, in a narrow valley on the Moselle, 190 miles E.S.E. of Paris. It was once the capital of a duchy in Lorraine, is still capital of department Vosges, and consists of three distinct parts—the Grande Ville on the right bank, the Petite Ville on an island formed by the river and a canal, and the Faubourg des Capuchins on the left bank. It is well built, consisting of spacious and clean though badly-paved streets, and has handsome quays, an ancient Gothic church, a communal college, a public library of 20,000 vols., a museum, a theatre, an hospital, and the ruins of an old castle, seated on a commanding height. The manufactures consist of articles in iron and brass, cutlery, earthenware, leather, oil, and chemicals, and both freestone and marble are largely quarried in the vicinity. Pop. 11,870.

ÉPINAY, LOUISE FLORENCE PÉTRONELLE, MADAME D', born in 1725. This accomplished lady, celebrated for her connection with Rousseau, was the daughter of M. Tardieu Desclavelles, who lost his life in Flanders, in the service of Louis XV., and left his family in very moderate circumstances. She married her cousin D'Épinay, son of M. Delalive de Bellegarde, who received the office of farmer-general. But the extravagance of the young man soon disturbed the happiness which had been expected from this union, and compelled her to separate from him. During the earlier part of her life she formed an acquaintance with the philosopher of Geneva, who, quick and susceptible in all his feelings, devoted himself to the fascinating and accomplished woman with an ardour, the depth and strength of which he describes himself in his Confessions. She was not insensible to the homage of her *bear*, as she used to call him, on account of his eccentricities. She did all that was in her power to place him in a situation corresponding to his wishes. She gave him a cottage (the Hermitage, since so famous) in her park of Chevrette, in the vale of Montmorency. Here the author of the Nouvelle Héloise passed many days, rendered happy by his romantic attachment to Madame d'Épinay; until he became jealous of Baron Grimm, whom he had himself introduced to his mistress; and in consequence of this feeling, which he took no pains to conceal, a coolness, and finally an aversion, took place between him and the lady, which is but too plainly expressed in his Confessions. A defence of the later conduct of Madame d'Épinay towards Rousseau may be found in Grimm's Correspondence, where an account is also given of some works written by her, of which the most celebrated is Les Conversations d'Émilie. In this the authoress, in a rather cold, but neat style, sets forth the principles of moral instruction for children, with equal elegance and depth of thought. It obtained, in 1783, the prize offered by Monthion (the chancellor to the Count d'Artois) for useful works of this kind, in preference to the Adèle et Théodore of Madame de Genlis. She also wrote Lettres à mon Fils, and Mes Moments heureux. An abridgment of her highly interesting memoirs, and her correspondence, showing her relations with Duclos, Rousseau, Grimm, Holbach, Lambert, &c., appeared in Paris in three vols., in 1818. They give a true picture of the refined but corrupt manners which prevailed among the higher classes in France during the government of Louis XV. Madame d'Epinay died in 1783.

EPIPHANIUS, ST., Bishop of Constantia, was born in Palestine about 310. He was of a Jewish family. Affected by the religious enthusiasm of the period, he retired to a solitude near Eleutheropolis, his native town, where he founded a monastery. From this retreat he was dragged against his will about 367, to be consecrated Bishop of Salamis or Constantia, in Cyprus. He was well versed in the Scriptures, and in the eastern and classical languages. He was a zealous and unsparing denouncer of heresy, and in this capacity he combated the opinions of Arius and Origen. Such was his zeal that he travelled to Jerusalem, Antioch, and Constantinople to denounce both bishops and solitaries suspected of heresy. In his work Panarion, or the Antidote against Heresies, he gives the history, together with the refutation, of a great number of heresies. This work has been published separately (Leipzig, 1860). He also wrote a treatise on the weights and measures of the Jews. His festival is on the 12th of May. He died on a journey from Constantinople to Cyprus, in the winter of 402–3.

EPIPHANY (Greek, *epiphaneia*, from *epiphainein*, to show forth), a festival, otherwise called the *manifestation of Christ to the Gentiles*, observed on the 6th of January, in honour of the appearance of our Saviour to the three magi, or wise men, who came to adore him and bring him presents. The festival of Epiphany is called by the Greeks the *feast of lights*, because our Saviour is said to have been baptized on this day; the baptism is by them called *illumination*. The feast of Epiphany is also called, in Germany, the *festival of the three holy kings*. The primitive church also gave this name to the birth-day of our Saviour. The Greek Church calls the same feast *Theophany* (appearance of God).

EPIRUS (Greek, *Epeirus*), the most southerly part of modern Albania; a province bordering on Greece, and sometimes included in it; though not inhabited by the Hellenic race. The name was originally given to the whole of Western Greece, as far as Corinth. Epirus proper is a wild and mountainous country, and has always been the abode of robbers. The mountains run north and south, interspersed with numerous but limited valleys. The most extensive plain is the Joannina or Jannina, in which was probably situated the oracle of Dodona, the most ancient in Greece. There are no traces remaining of that celebrated city, nor has the grove of oaks, with the never-failing fountains, been yet discovered. Mythology probably derived from this country the infernal rivers of Acheron and Cocytus; and here, too, the poisonous vapours exhaled from Avernus (now called *Vall de l' Orso*). The number of Epirot tribes in early times was fourteen; the Chaonians were the most powerful. The ancient inhabitants are supposed to have

been of Pelasgian origin. Several Greek colonies settled among them. Each tribe was originally ruled by a separate king; but the Molossians at last acquired the ascendency, and the kings of this tribe took the name of kings of Epirus. The most celebrated of the kings of Epirus was Pyrrhus, who made war upon the Romans. Being delivered from the Macedonian yoke by the Romans, when they conquered Philip II., the Epirots gradually became so powerful that they assisted Antiochus and Perseus against the Romans, but thereby only hastened their own downfall. Paulus Æmilius subdued them, and gave up their towns to pillage. Seventy towns were destroyed, and 150,000 men sold into slavery. Epirus, from this time, shared the fortunes of the Roman Empire, till it was conquered by the Turks. After the capture of Constantinople by the Crusaders in 1204, a branch of the imperial family of Comnenus established itself in Epirus, which it ruled for upwards (in 1467) of two centuries. This dynasty is known as the *despots of Albania*. Its last representative, George Castriota (Scanderbeg), was given by his father as a hostage to Amurath II., who occupied Albania in 1432. Castriota contrived to regain possession of his principality, and throw off the Turkish yoke, which he successfully resisted till his death in 1467, after which the country again fell under the Turkish dominion.

EPISCOPACY, the system of church government by bishops and archbishops. See BISHOP.

EPISODE (Latin, *episodium*, from the Greek *epeisodion*, something adventitious) is employed by Aristotle in two significations. Sometimes it denotes those parts of a play which are between the choruses, and sometimes an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it. In modern times it has been used in the latter sense only. With the best poets the episode is not a mere patch or piece to fill out the poem, not an unnecessary appendage, serving merely to swell the size of the work, but it is closely connected with the subject, points out important consequences, or develops hidden causes. Of this kind is the narrative of the destruction of Troy, in Virgil's Æneid. This was the cause of the hero's leaving his country, and wandering over the sea; but the poet does not commence with it because he wishes to bring the plot into a narrower space, in order to make it more distinct and lively. He therefore inserts it in the course of the story, but so skilfully that we expect it in this very place; and it not only serves as a key to what has gone before, but prepares us for what is to come, viz. the passion of Dido. In this way the episode becomes an essential part of the whole, as it must necessarily be, if it is of any importance to preserve the unity of the poem. So with the tale in Wieland's Oberon; it appears incidental, but explains to us the reason of Oberon's singular interest in the fate of Huon. In epic poetry there is much more room for the episode than in dramatic, where the poem is confined to a present action. The term *episode* has also been transferred to painting, especially historic painting, in a sense analogous to that which it has in poetry. A beautiful instance of the skilful use of the episode in the modern novel is given in Manzoni's I promessi sposi, in the tale of the Nun of Monza.

EPISTOLÆ OBSCURORUM VIRORUM (Letters of Obscure Men), a series of letters arising out of a literary controversy which immediately preceded the Reformation in Germany. The revival of ancient learning was prosecuted in Germany with great zeal by a small band of scholars, who were violently opposed in their advocacy of a reform of learning by the university and ecclesiastical authorities. Among the advocates of learning, one of the most distinguished was Reuchlin, who, in the course of a controversy on the introduction of Hebrew literature, was accused by the theologians of Cologne of blasphemy and other crimes against religion. This controversy proceeded to such an extent that it was repeatedly appealed to the pope. Reuchlin had published a series of letters addressed to him under the title of Epistolæ Illustrium Virorum ad Reuchlinum, and it was apparently in imitation of this title that the formidable satire Epistolæ Obscurorum Virorum ad Venerabilem Virum Magistrum Ortuinum Gratium took its name. Ortuinus, it may be explained, was the chief opponent of Reuchlin. The satire was written in what was called kitchen or monkish Latin. The letters were supposed to be addressed to Ortuinus by clergymen and professors in the Rhine districts, particularly of Cologne, all belonging to the obscurant party, the party opposed to learning and progress, who are made, in the most innocent way, to expose their own ignorance, profanity, and licentiousness. The work is unsparing, and probably not always fair in its satire; but it seems not to have been overdone, as many of the party it was intended to ridicule took it at first for a serious production, and applauded its advocacy of their views. The same mistake as to its origin has since been made, even by scholars. It is still considered as one of the most masterly sarcasms in the history of literature, and its importance is enhanced by the effect it had in promoting the cause of the Reformation, which was justly acknowledged by Luther. The first volume appeared in 1515, the second in 1517. In the latter year it was condemned by the pope. The authorship of this satire has been a fertile subject of controversy, and is yet apparently far from being settled. Sir Wm. Hamilton (see his article on the Epistolæ in the Discussions on Philosophy, &c.) attributed it to Hutten, Croten, and Buschius. Later authorities do not appear to have adopted his view. The latest edition of the Epistolæ is by Böcking (Leipzig, 1858).

EPISTYLIUM. See ARCHITECTURE.

EPITAPH (from the Greek *epitaphion*, from *epi*, upon, and *taphos*, tomb), an inscription upon a tomb. Epitaphs were in use both among the Greeks and Romans. The tombs of the Romans were placed near the highways, and their epitaphs commonly commenced with, *Sta viator!* (Stop, traveller!) The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstones, epitaphs are usually, in addition to any record of the virtues of the departed, used as a medium for expressing the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, of conveying moral lessons on the brevity of life, &c. In the catacombs of Rome, which were made a place of refuge by the persecuted Christians under the pagan emperors, there are many remarkable epitaphs of this description.

The epitaph, says Oxenstiern, is the last of human vanities. It would be desirable, says Marmontel, that every man should write his epitaph early in life; that he should make it as flattering as possible; and that he should spend his life in trying to deserve it.

We will here give a few examples of memorable epitaphs. One of the happiest is that of Sir Christopher Wren, in St. Paul's, London, of which he was the architect:—

Si monumentum quæris, circumspice.

'If you ask for his monument,—look around.'

The following is the epitaph of a Roman matron:—

Domum mansit
Lanam fecit.
'She kept the house and span wool.'

Sta, viator; heroem calcas

has been ascribed both to Montecuculi and to General Merci. Epitaph on Alexander the Great:—

Sufficit huic tumulus, cui non sufficerat orbis.
'This tomb suffices for him for whom the world did not suffice.'

Count Tessin, governor of Gustavus III. of Sweden, ordered the words—

Tandem felix—
'Happy at last,'

to be inscribed on his tomb. The following is Sir Isaac Newton's epitaph:—

Isaacum Newton,
Quem immortalem
Testantur Tempus, Natura, Cœlum,
Mortalem hoc Marmor
Fatetur.

'This marble acknowledges Isaac Newton mortal, to whose immortality time, nature, and heaven bear witness.'

St. Anne's Church, at Cracow, has the following suggestive epitaph, dedicated by Count Sierakowski to Copernicus:—

Sta, sol, ne moveare.
Stand, O sun! move not.

The quaint humour of Dr. Franklin expressed itself in the following lines:—

The body
of
Benjamin Franklin
printer
(like the cover of an old book,
its contents torn out,
and stripped of its lettering and gilding),
lies here, food for worms;
yet the work itself shall not be lost,
for it will (as he believed) appear once more
in a new
and more beautiful edition,
corrected and amended
by
the Author.

In humorous and witty epitaphs the French are peculiarly happy. Take, for instance, the following on Piron, by himself:—

Ci-gît Piron qui ne fut rien,
Pas même académicien.

'Here lies Piron, who was nothing—not even a member of the Academy.'

It is not necessary to say against whom the irony is directed. Another of Piron's contains a specimen of irony still more concentrated and crushing. On Marshal de Belle-Isle, buried at St. Denis, beside Turenne:—

Ci-gît le glorieux à côté de la gloire.
'Here lies the (vain) glorious beside glory.'

The following, by La Mannoye, was a competitive epitaph, on a rich man, for 300 francs:—

Ci-gît un très grand personnage,
Qui fut d'un illustre lignage,
Qui posséda mille vertus,
Qui ne trompa jamais, qui fut toujours sage;
Je n'en dirai pas davantage,
C'est trop mentir pour cent écus.

'Here lies a very distinguished man, who was of an illustrious lineage, and was possessed of a thousand virtues: he never deceived; he always acted wisely. I shall say no more; it is too many lies to tell for a hundred crowns.'

On Robespierre:—

Passant ne pleure pas ma mort:
Si je vivais tu serais mort.

'Passenger, do not weep for me; if I lived, dead you would be.'

There are few examples of a style of epitaph which is among the highest of all: but there are only a few names which can thus be distinguished. The tomb of Masséna bears one word only, on an elevated monument:—

MASSÉNA.

EPITHALAMIUM (from *epi*, and *thalamos*, a chamber), a nuptial song. Among the Greeks and Romans it was sung by young men and maids at the door of the bridal chamber of a new-married couple. It was accompanied with shouting and stamping with the feet. It consisted of praises of the bridegroom and bride, with wishes for their happiness. Among the Romans the husband scattered nuts among the young men at the same time. Examples may be seen in Theocritus' epithalamium of Helen, and the epithalamium of Catullus.

EPITOME (from the Greek *epitomē*, from *epi*, and *temnō*, I cut), an abridgment, an abbreviation, or compendious abstract.

EPOCH, or ERA, is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. As there is no astronomical consideration which dictates the choice of one epoch rather than another the choice is arbitrary, and being, as has been observed, usually determined by the opinion which particular peoples in various ages have had of particular events, the number of epochs which have acquired historical importance is rather considerable, and the difficulty which has arisen in harmonizing the dates of events recorded by different observers in various times and countries using all this variety of epochs has also been considerable. This difficulty, it will be seen, consists of two distinct elements proceeding from two different sources. There is first the mere difficulty of reconciling modes of enumeration which have not the same starting-point. What makes this difficulty at all perplexing is that the various epochs not only begin with different years, but these various starting-points are not all reckoned from the same period of the year; and even in using the same epoch for a protracted period of time, the day fixed for the commencement of the year has occasionally been changed, so that in transferring dates from one epoch to another it is necessary to know accurately the time of the commencement of the year in each. The other element of complication is much the more serious one. Not only the commencement but the duration of the year varies in the different styles of reckoning, and here again the practice of each particular style is not constant throughout the period of its use. Sometimes the lunar year is founded on, sometimes the solar, sometimes a changeable year founded on an accommodation between the two. The solar year, as is well known, does not consist of an exact number of days, hence even when it is founded on exclusively, an adjustment, such as our leap-years, is necessary to make the commencement of the year always recur at the same season. As each of the various styles which have been in use at various times, or simultaneously in different places, has its own mode of adjustment, some more and some less accurate, it will easily be seen how much this complicates the reconciliation of dates. We shall here briefly enumerate the more important historical epochs, with such particulars as may enable the reader with general accuracy to bring them into correspondence with that in common use. For further details on the mode of reckoning see CALENDAR.

The Creation.—The biblical record of the creation has formed the foundation of numerous chronologies. Of course the authorities (Jewish and Christian) on

these various modes of reckoning do not agree as to the time signified by the common authority for the event founded on. The more important of these epochs, of which there are about 140 different varieties, are—1. The epoch adopted by Bossuet, Ussher, and other Catholic and Protestant divines, which places the creation in B.C. 4004. 2. The *Era of Constantinople* (adopted by Russia), B.C. 5508. The civil year begins 1st September, the ecclesiastical year about the end of March. 3. The *Era of Antioch*, used till A.D. 284, placed the creation B.C. 5502. It was merged in the following year in—4. The *Era of Alexandria*, which made the creation B.C. 5492. This is also the *Abyssinian Era*. 5. *Jewish Era*. The common era of the Jews places the creation in B.C. 3760. Their year is lunar-solar, that is lunar with intercalary months, forming a cycle of 19 years, of which 12 have 12 months and 7, 13 months. The year thus varies from 353 to 385 days. The civil year begins with the new moon following the autumn equinox. The eras dating from the creation are distinguished by the initials A.M. Const., Abyss., &c., are sometimes added to distinguish the particular epochs.

The *Julian Period* commences B.C. 4713. It is an arbitrary epoch, fixed for the purpose of computing all dates forward, as in the case of the creation epochs.

The Olympiads.—The Greeks computed their time by periods of four years, called Olympiads. Their year was lunar, with intercalary months. (See CALENDAR.) The first Olympiad, being the year in which Corœbus was victor in the Olympic games, was in the year B.C. 776. The period of the commencement of the year, which was variable, was about July. The contraction used for the Olympic epoch is Olymp.

The Roman Era (Ab Urbe Condita).—The Romans dated from the supposed era of the foundation of their city, the 21st of April, in the third year of the sixth Olympiad, or B.C. 753 (according to some authorities B.C. 752). This epoch is designated by the initials A. U. C. The Roman mode of computation was the foundation of our modern chronology. See CALENDAR.

Era of the Seleucides commences B.C. 1st October, 312, the epoch when Seleucus I. (Nicator) took possession of Babylon. The year consisted of 365 days, with a leap-year every fourth year. This era is used in the book of Maccabees.

The Spanish Era is reckoned from B.C. 1st January, 38. The months and days were the same as those of the Julian calendar. It was disused in Arragon in 1350; in Valencia 1358; in Castile 1383; in Portugal about 1415.

The Christian Era, or mode of computing from supposed data of the birth of Christ, was first introduced in the sixth century, and did not become popular and general for a considerable time afterwards. It had been generally adopted by the year 1000. In reckoning back from the Christian era two modes of computation have been adopted, the one counting the year immediately preceding the era as 0, the other as 1. The latter is the more common. For particulars of the mode of reckoning the years of the Christian era, and the changes which it has undergone, see CALENDAR.

Armenian Era commenced 7th July, 552, and was superseded by the Julian era about 1330. The year consisted of only 365 days.

The Mohammedan Era, or *Hegira*, commences on 16th July, 622. The conversion of the Mohammedan into Christian chronology causes more difficulty and confusion than arises with any of the other modes of reckoning. The Mohammedan year is purely lunar. It consists of 12 months, and each month commences with the appearance of the new moon. Hence their years have no correspondence with the recurrence of the seasons, and to know the period when a Mohammedan year begins it must be reckoned from the beginning of the era. In chronology, history, &c., they use months of 29 and 30 days alternately, making the year consist of 354 days. Eleven times in 30 years 1 day is added to the last month, making 355 days in the year. The mean length of the year is thus $354\frac{11}{30}$ days, of the month $29\frac{5}{30}\frac{1}{0}\frac{1}{0}$, differing from the true lunation by little more than 3 seconds, or less than a day in 2260 years. As 33 Mohammedan years amount to only 6 days (including intercalary days and leap-years) more than 32 of our years, by deducting 1 year from each 33 Mohammedan years, and adding $621\frac{1}{2}$ years, the year of the Christian era will approximately be found. The Hegira is distinguished by the initials A.H.

Persian Era (era of Yezdegird III.) began 16th July, 632. The year consisted of 365 days. It was reformed in 1075 by the addition of a day whenever it was necessary to make the commencement of the year occur on the day of the sun's passing the same degree of the ecliptic. The months have each 30 days, with 5 or 6 days intercalated. This era is still used by the Parsees in India.

Indian Chronology.—The natives of India use a great variety of epochs, some of which are but little understood even by themselves, and almost all are deficient in universality and uniformity, so that the same epoch, nominally, will be found to vary many days, or even a year, in different provinces. The solar, or more properly the sidereal year, is that which is most in use for public business, particularly since the introduction of European power into India. This year is calculated somewhat differently by Indian astronomers from the European reckoning, so that there is about a day more in sixty years by the Indian chronology than by ours. The luni-solar computation, though less prevalent than formerly, is still used in many parts of India, particularly in regard to religious observances, as the regulation of festivals, and in domestic life. The luni-solar mode varies in different provinces, some beginning the month at full moon, others at new moon. There are other matters which render the computation of the Hindu luni-solar year so complicated that it cannot be accurately known without an acquaintance with Hindu astronomy.

The best known eras computed by solar time are the *Kaliyuga*, which dates from 3101 years before Christ, and the *Salivahana* from A.D. 77. Both are computed astronomically, losing 1 day in 60 years by our computation. The era of *Vikramaditya*, beginning 57 years B.C., is computed by lunar months, with intercalations made according to astronomical observation, and bringing the year up to 365 or 366 days. The *Bengali* year was formerly identical with the Hegira, but is now reckoned by solar computation.

The Chinese, like all the nations of the north-east of Asia, reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. As all those nations follow the same system, we shall detail it here more particularly. They have two series of words, one of ten, and the other of twelve words; a combination of the first words in both orders is the name of the first year; the next in each series are taken for the second year; and so to the tenth: in the eleventh year, the series of ten being exhausted, they begin again with the first, combining it with the eleventh of the second series; in the twelfth year, the second word of the first series is combined with the twelfth of the second; for the thirteenth year, the

combination of the third word of the first list with the first of the second list is taken, that list also being now exhausted. To make this clearer, we shall designate the series of ten by the Roman letters, that of twelve by the italics, and the whole cycle of 60 will stand thus:—

1 a *a*	16 f *d*	31 a *g*	46 f *k*
2 b *b*	17 g *e*	32 b *h*	47 g *l*
3 c *c*	18 h *f*	33 c *i*	48 h *m*
4 d *d*	19 i *g*	34 d *k*	49 i *a*
5 e *e*	20 k *h*	35 e *l*	50 k *b*
6 f *f*	21 a *i*	36 f *m*	51 a *c*
7 g *g*	22 b *k*	37 g *a*	52 b *d*
8 h *h*	23 c *l*	38 h *b*	53 c *e*
9 i *i*	24 d *m*	39 i *c*	54 d *f*
10 k *k*	25 e *a*	40 k *d*	55 e *g*
11 a *l*	26 f *b*	41 a *e*	56 f *h*
12 b *m*	27 g *c*	42 b *f*	57 g *i*
13 c *a*	28 h *d*	43 c *g*	58 h *k*
14 d *b*	29 i *e*	44 d *h*	59 i *l*
15 e *c*	30 k *f*	45 e *i*	60 k *m*

The series of 10 is designated in China by the name of *tĕcn kan*, or celestial signs. The Chinese months are lunar, of 29 and 30 days each. Their years have ordinarily 12 months, but a 13th is added whenever there are two new moons while the sun is in one sign of the zodiac. This will occur seven times in nineteen years. The boasted knowledge of the Chinese in astronomy has not been sufficient to enable them to compute their time correctly. In 1290 A.D. the Arab Jemaleddin composed a calendar for them, which remained in use until the time of the Jesuit Adam Schaal, who was the director of their calendar until 1664. It then remained for five years in the hands of the natives, who so deranged it, that, when it was again submitted to the direction of the Christians, it was found necessary to expunge a month to bring the commencement of the year to the proper season. It has since that time been almost constantly under the care of Christians. The first cycle, according to the Romish missionaries, began February, 2397 B.C. To find out the Chinese time, multiply the elapsed cycle by 60, and add the odd years; then, if the time be before Christ, subtract the sum from 2398; but if after Christ, subtract 2397 from it; the remainder will be the year required.

The Japanese have a cycle of 60 years, like that of the Chinese, formed by a combination of words of two series. The series of ten is formed of the names of the elements, of which the Japanese reckon five, doubled by the addition of the masculine and feminine endings *je* and *to*.

The natives of America, previous to its discovery by Europeans, particularly the Peruvians and Mexicans, appear to have had a considerable acquaintance with astronomy, and to have reckoned their time with great care. The Mexican year consisted of 365 days, composed of 18 months of 20 days, and 5 added days. At the end of a cycle of 52 years 12 and 13 days were added alternately, making the mean year very near the truth.

EPOCH, in geology, has now a very different meaning from that which it formerly had. Instead of corresponding to a period in the history of the earth, it answers to a period in the history of a particular locality. Epochs are determined by the occurrence of particular kinds of animal and vegetable life in a group of strata which are marked off by unconformity above and below; the rocks were deposited and the organisms lived in that locality between the two great geographical changes, one of which preceded the earliest deposit of the particular group of rocks, while the other closed the series. The conformably sequent strata of this series belong to one epoch; but the dissimilar animals and plants which lived elsewhere at the same time were either not preserved at all in deposits, or were entombed in deposits of a different kind. In the latter case the assemblage would represent an epoch for that particular locality. Thus the Old Red Sandstone and the Devonian strata, the former lacustrine, the latter marine, were probably identical in epoch as they were contiguous in area. The Wealden epoch in England was anterior to that of the Chalk, if judged by the superposition of the strata and the difference of the fossils. But the Wealden land was the continent of an ocean, the cretaceous, of which the Atlantic at the present time is the direct successor. The Wealden epoch in Britain was short, judged by the succession of deposits, but we know it to have been longer than that of the cretaceous in the west of Europe. If we imagine the floors of the German Ocean and the Australian seas, just as they now are, to be covered by thick deposits of strata, these strata would, judged by their fossil contents, belong to different epochs: but we know that they only belong to different zoological provinces. Natural groups of strata represent, therefore, the epochs during which the animals and plants they contain lived and died in a particular area, and where a closely similar assemblage is found in strata at a distant locality we have therefore proof that during an epoch of unknown length similar organisms flourished there; but the epoch may have been before, identical with, or later than that first studied. Epoch is thus a term of only local application, and the proof that, though the assemblage of rocks may be a natural one for one locality, it is not so for a great area, is found in the fact that the unconformities which indicate great geographical change do not occur at identical points everywhere. Thus the Silurian and Old Red formations are conformable in England, unconformable in Scotland, and unconformities in both series are differently placed in America. Whether or not any epoch ever existed in the earlier sense of the term, whether, in other words, the life over the whole surface of the earth was at any one time alike, we cannot tell. The probability is that no such period ever existed, and that therefore the phenomena which represent an epoch are the record of local geographical events, and of a local fauna and flora.

EPODE (from the Greek *epōdos*), the last division in the choral song of the ancients, which was sung when the chorus, after the strophe and antistrophe, had returned to its place (see CHORUS); so that it was a kind of closing song, or finale. This epode had a peculiar measure, and an arbitrary number of verses. By the term *epode* is also understood a sort of satirical ode; according to Hephæstion, one which has longer and shorter iambic verses, following each other alternately. This name is also given to the fifth book of the odes of Horace. All the odes in this book, however, are not satirical, and Scaliger therefore supposes that the name here signifies an appendix to the odes: the epodes having been joined to the other works of the poet after his death.

EPOPEE. See EPIC.

EPPING, a village in Essex, situated 17 miles from London, on the road to Newmarket, and in the midst of a forest to which it gives name. This ancient royal forest, though much of it is now under cultivation, still presents some fine woodland scenery.

EPROUVETTE, the name of an instrument for ascertaining the strength of gunpowder, or of comparing the strength of different kinds of gunpowder. One of the best, for the proof of powder in artillery, is that contrived by Dr. Hutton. It consists of a small brass gun, about 2½ feet long, suspended by a metallic stem, or rod, turning by an axis on a firm and strong frame, by means of which the piece oscillates in a circular arc. A little below the axis the stem divides into two branches, reaching down to the

gun, to which the lower ends of the branches are fixed, the one near the muzzle, the other near the breech of the piece. The upper end of the stem is firmly attached to the axis, which turns very freely by its extremities in the sockets of the supporting frame, by which means the gun and stem vibrate together in a vertical plane with a very small degree of friction. The piece is charged with a small quantity of powder (usually about 2 ounces) without any ball, and then fired; by the force of the explosion the piece is made to recoil or vibrate, describing an arch or angle, which will be greater or less according to the quantity or strength of the powder. One of the most usual methods of testing the strength of gunpowder is to load, say a mortar of 8-inch bore, with an accurately turned shot, and a certain quantity of powder. The distance the shot is propelled determines the strength of the powder. The ordinary eprouvette is an instrument in the form of a small pistol without the barrel. The breech-chamber is closed by a plate communicating with a strong spring. On the explosion the plate is driven back to a greater or less distance according to the strength of the powder, and is retained at the extreme distance by a ratchet-wheel.

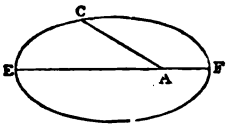
EPSOM (Saxon, *Ebbsham*), a market-town in the county of Surrey, England, 15 miles S.W. of London, on a branch of the Brighton Railway, is irregularly laid out, but contains a number of good houses. Some brick-making, brewing, and malting are carried on. In the vicinity is a celebrated mineral spring, from which the well-known Epsom salts were at one time manufactured. After the discovery of this medicinal spa, Epsom became a fashionable watering-place, and rapidly increased in buildings and population, but afterwards fell into decay. Another source of attraction, however, has since arisen—the annual races held on the Downs. These commence on Tuesday, and continue to the end of the week preceding Whitsuntide; the Derby stakes are run for on Wednesday, which is the principal day, and the Oaks on Friday. They are fashionably and numerously attended, many hundreds of thousands of people visiting Epsom during the race week. Pop. 6276.

EPSOM SALT, EPSOMITE, or HAIR SALT (sulphate of magnesium, $Mg\,SO_4\,7H_2O$, cathartic salt), appears in capillary fibres or acicular crystals; and sometimes presents minute rhombic prisms. The fibres are sometimes collected into masses; and it also occurs in a loose, mealy powder: its colour, white, grayish, or yellowish: it is transparent, or translucent, with a saltish, bitter taste. It is soluble in its own weight of cold water, and effloresces on exposure to the air. It is found covering the crevices of rocks, in caverns, old pits, &c., in the vicinity of Jena, on the Harz, in Bohemia, &c., in mineral springs, in several lakes in Asia, and in sea-water. It is obtained for use from these sources, or more commonly by artificial processes from magnesian limestone, and is employed in medicine as a purgative, and in the arts. The English name is derived from the circumstance of its having been first procured from the mineral waters at Epsom. See MAGNESIUM.

EQUATION, in algebra, is an algebraic expression which indicates that two quantities are equal. This is done by displaying the two quantities in algebraic symbols, and writing the sign of equality (=) between them. Thus: $5x+7=32$, and $ax^2+bx+c=0$, are equations, each of which indicates the equality of the quantity written on the left of the sign (=) to that written on the right of the sign. Usually the object of writing down an algebraic equation is to express in symbols known relations between given and unknown quantities, and thence by algebraic processes to determine the latter in terms of the former. For example, the first of the equations displayed above is the algebraical expression of the following problem:—Find a number such that if it be multiplied by 5, and 7 added to the product, the sum shall be 32. The symbol x there represents the unknown number; it is shown in the equation multiplied by 5, and the product is connected by the sign (+), which signifies addition, with the number 7, and on the right-hand side of the sign (=) is written 32, the number which the conditions of the problem state the sum above mentioned is equal to.

Equations are distinguished into various sorts according to their forms. Unknown quantities are generally represented by the last few letters of the alphabet, x, y, z, and sometimes some of the others; and the different sorts of equations are named from the forms in which the unknown quantities appear. Thus equations are said to be of the *first*, *second*, *third*, &c., *degree*, according as the unknown quantity appears in the first, second, or third power. $ax+b=c$ is of the first degree; $ax^2+bx=c$ is of the second degree; $ax^3=c-b$ is an equation of the third degree. Again, there are trigonometrical equations, which contain such trigonometrical *functions*, as they are called, of the unknown quantity, as *sinx*, *cosy*; and transcendental equations which contain such functions as *logx*, e^x. These are, however, not generally discussed in the great and most important branch of algebra technically called *theory of equations*.

EQUATION, in astronomy, any quantity to be added to or subtracted from the mean motion of any heavenly body, in order to determine its true place at any given time. Thus we have the equation of the centre, a quantity to be added to or subtracted from the anomaly, in order to determine the true position of a heavenly body, thus: let the curve E C F represent the earth's orbit (which is an ellipse), E F the line of the apsides, and A the position of the sun. When the earth is in any position as C, the line A C drawn from the sun to the planet is the radius vector, then will the angle C A F be the anomaly, or the angular distance from the perihelion. Were the earth's motion uniform the increase or decrease of this angle would be equal in equal times, and the mean anomaly would be the true anomaly; but the earth's motion is retarded as it advances from F to C, is slowest at E, and is accelerated from that point, the aphelion, through the other half of its orbit till it arrives at F, the perihelion. The quantity to be added to the mean angular motion, during one portion of the orbit, or subtracted from it in the other, in order to find the true anomaly, is called the equation of the centre.



EQUATION, in chemistry, is a collection of symbols to denote that two or more definite bodies —simple or compound—have been brought within the sphere of chemical action, that a reaction has taken place, and that new bodies are produced. It is called an equation because the total weight of the substances concerned remains the same. An equation is possible, therefore, only where it is known what has happened to all the bodies, or when all the matter has been accounted for. On the other hand, an equation is not necessarily correct because the weight of the bodies on the two sides is equal: the bodies must be represented as in proper combination with each other. An equation therefore denotes not merely equality of weight but the result of a chemical action, and it is nothing else than the expression in brief of the result of a chemical investigation. Nothing can be predicted from the mere weights of the substances what will take place chemically, and it is only after this has been determined experimentally

that the equation representing the distribution of the weights of the bodies concerned can be calculated and written out symbolically.

EQUATION, PERSONAL. In astronomical observations depending on time, for example, in observing the time of passage of a star across the middle wire of the transit instrument, it is found that two observers always assign slightly different instants for that of the occurrence of the event. One observer is found always to record it as happening a little sooner than the right time, another always a little later. With skilled observers this error is found to be nearly constant. The correction applied for it is called the *personal equation*.

EQUATION OF TIME, in astronomy, denotes the difference between mean and apparent time, or the reduction of the apparent unequal time, or motion of the sun or a planet, to equable and mean time or motion. If the earth had only a diurnal motion, without an annual, any given meridian would revolve from the sun to the sun again in the same space of time as from any star to the same star again, because the sun would never change his place with respect to the stars. But as the earth advances almost a degree in its orbit in the time that it turns eastward round its axis, whatever star passes over the meridian on any day with the sun, will pass over the same meridian on the next day, when the sun is almost a degree short of it, that is, 3 minutes 56 seconds sooner. If the year contained only 360 days, as the ecliptic does 360°, and the sun's motion were equable, his apparent place would change a degree every day, and then the sidereal days would be 4 minutes shorter than the solar. The mean and apparent solar days are never equal except when the sun's daily motion in right ascension is 59″; which is nearly the case about the 15th of April, the 15th of June, the 1st of September, and 24th of December, when the equation is zero; and it is at its greatest about the 1st of November, when it is 16 minutes 14 seconds.

EQUATOR. By the celestial equator is understood that imaginary great circle in the heavens, the plane of which is perpendicular to the axis of the earth; it is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be produced to meet the heavens, and its axis is this produced axis. It divides the celestial sphere into the northern and southern hemispheres. During his apparent yearly course the sun is twice in the equator, at the beginning of spring and of autumn. (See EQUINOX and DAY.) Then the day and night are equal—whence the name of *equinox*. The situation of the stars, with respect to the equator, is determined by their declination and right ascension (which see). The terrestrial equator, called by mariners simply the *line*, is that great circle of our globe, every point of which is 90° from the poles, which are also its poles, and its axis is the axis of the earth. It is in the plane of the celestial equator. All places which are on it have invariably equal days and nights. (See DAY.) Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitude of places, both north and south. See LATITUDE.

EQUATORIAL. The telescope used in observatories for searching the heavens. Other instruments, the transit instrument and the mural circle, are only used for stars that are crossing the meridian. The equatorial is movable about two mutually perpendicular axes, one of which points to the pole of the heavens. It can be moved so as to point in any required direction, and on account of one of the axes round which it turns pointing to the celestial pole, it follows a star by means of a single motion.

EQUERRY, an officer of state under the master of the horse. There are six equerries, who ride abroad with the sovereign; for which purpose they give their attendance monthly, one at a time. The *clerk-marshal*, as the chief equerry is styled, has a salary of £500 per annum, and the equerries in ordinary have £300.

EQUESTRIAN ORDER, in Roman antiquities (*ordo equestris*). The *equites* did not at first form a distinct order, but were merely selected, 100 from each tribe, as the body-guard of the king, and were called *celeres*, because they were mounted. Their number was afterwards increased; but when the equites became a distinct order, or class, is not known with certainty; it was probably soon after the expulsion of the kings. None but those who were named by the censor belonged to the order of equites; they were taken from plebeian or patrician families, and those who were of illustrious descent were called *illustres*, *speciosi*, &c. Their number was not fixed. In the later periods of the republic, property of the value of 400 *sestertia* was required for admission into it. The privileges of a knight or *eques* were, 1, to receive a horse from the state, as well as a sum of money for its keep; 2, a gold ring (hence *annulo aureo donari*, to have a gold ring granted one, that is, to be made a knight); 3, *angustus clavus*, a narrow strip of purple on the tunic; 4, a particular seat on public occasions. At first their duty was to serve the republic in war; but at a later period they became judges and farmers of the public revenues. Caius and Tiberius Gracchus wrested the right of being judges from the senate, and gave it to the equites. Some authors date the elevation of the equites to a third class at this period. Every fifth year the censor held a review of the equites, on which occasion they passed before him, leading their horses. If any one of their number had been guilty of any offence, even if he had only neglected his horse, the censor ordered it to be sold, which was equivalent to degrading him from the order; hence *adimere equum*, to take away his horse, that is, to degrade a knight. Others who had committed slighter offences, for which they were to be deprived of their rank, were omitted in the list, which was read aloud by the censor. The first on the list was called *princeps*. The farmers of the revenue were divided into classes, each having a president, called *magister societatis;* the members were called *publicani*. Under the later emperors the order disappeared from the stage of political life.

EQUIDÆ, a family of Mammalia, of the order Pachydermata, which includes the horse, the ass, the mule, the zebra, the quagga, the dziggethai, and the dauw. They have but a single toe at the end of each extremity, and this toe is incased in a single undivided hoof. There are, however, on each side of the metacarpus and metatarsus two small rudimentary processes representing two lateral toes. The equidæ have six incisors in each jaw, and six molars on each side in each jaw. The males have also two small canine teeth in the upper jaw, and sometimes in both jaws. The stomach is simple, but the intestines are long and the cæcum large. The female has two teats placed on the pubes. This family is divided into two genera, *Equus* (the horse), which has the tail covered with long hair to the base, the fore and hind legs with a wart on the inner side; and *Asinus* (including the ass, zebra, quagga, &c.), which has the tail covered with long hair at the extremity: the mane of the horse is long and flowing, while that of this genus is short and upright. In the horse's coat there is an obvious tendency to the formation of small round spots of a different shade from that of the ground, while in the genus *Asinus* the markings are invariably disposed in stripes.

EQUINOCTIAL, in astronomy, synonymous with equator. When the sun is on the equator there is equal length of day and night over all the earth: hence the name *equinoctial*. See EQUATOR.

EQUINOCTIAL GALES, storms which are observed generally to take place about the time of the sun's crossing the equator or equinoctial line, that is, at the vernal and autumnal equinox, in March and September. See EQUINOX.

EQUINOCTIAL POINTS are the two points wherein the equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal* point; and the other, in the first point of Libra, the *autumnal* point.

EQUINOX is that time of the year when the day and night are equal: the length of the day is then twelve hours; the sun is ascending six hours, and descending the same time. This is the case twice a year, in spring and in autumn, when the sun is on the equator. When the sun is in this situation the horizon of every place is divided into two equal parts by the circle bounding light and darkness; hence the sun is visible everywhere twelve hours, and invisible for the same time in each twenty-four hours. (See DAY.) The vernal equinox is on the 21st March, and marks the beginning of spring; the autumnal is on the 23d September, which is considered the commencement of autumn; at all other times the lengths of the day and of the night are unequal, and their difference is the greater the more we approach either pole, and in the same latitude it is everywhere the same. Under the line this inequality entirely vanishes; there, during the day, which is equal to the night, the sun always ascends six hours, and descends six hours. In the opposite hemisphere of our earth the inequality of the days increases in proportion to the latitude: the days increase there while they diminish with us, and *vice versa*. The points where the ecliptic comes in contact with the equator are called *equinoctial* points. The vernal equinoctial point was formerly at the entrance of the constellation of Aries; hence the next thirty degrees of the ecliptic, reckoned eastward from it, have been called *Aries;* but this point long ago deserted the constellation of Aries, and now stands under Pisces; for it is found by observation that the equinoctial points, and all the other points of the ecliptic, are continually moving backward or westward; which retrograde motion of the equinoctial points is what is called the *precession of the equinoxes*. (See PRECESSION.) It appears from the result of calculations that the path of either of the poles is a circle, the poles of which coincide with those of the ecliptic, and that the pole will move along that circle so slowly as to accomplish the whole revolution in about 25,791 years nearly. The diameter of this circle is equal to twice the inclination of the ecliptic to the equator, or about 47°. Now, as the ecliptic is a fixed circle in the heavens, but the equator, which must be equidistant from the poles, moves with the poles, therefore the equator must be constantly changing its intersection with the ecliptic. And from the best observations it appears that the equator cuts the ecliptic every year 50·25″ more to the westward than it did the year before; hence the sun's arrival at the equinoctial point precedes its arrival at the same fixed point of the heavens every year by 20 minutes 23 seconds of time, or by an arc of 50·25″. Thus, by little and little, these equinoctial points will cut the ecliptic more and more to the westward, till, after 25,791 years, they return to the same point.

EQUISETUM, a genus of cryptogamous plants, by some classed among the ferns, but generally regarded as a distinct order, *Equisetaceæ*. The species grow in wet places, and are popularly called *horse-tail's*. The fructification is in terminal, oval, or conical heads, composed of peltate scales; the spores are furnished with two club-shaped elaters, which exhibit a high degree of susceptibility to moisture. The stem is striate, and contains articulations, each surrounded at the base with a scarious sheath, which is toothed on the margin; the branches are verticillate and destitute of leaves. The *E. hyemale* (shave-grass, Dutch-rush, or scouring-rush) has a remarkably rough stem, and is used for polishing wood, ivory, and the metals; for this purpose a piece of iron wire is introduced into the hollow of the stem, which is then rubbed against the substance under operation. The asperity of the cuticle is owing to its containing a considerable proportion of silica. It is imported into this country in considerable quantities from Holland, and is an article of commerce in other parts of Europe.

EQUITY. We call that, in a moral sense, *equity*, which is founded in natural justice, in honesty, and in right *ex æquo et bono*. So, in an enlarged view (as Mr. Justice Blackstone has observed, 3 Comm. 429), 'equity, in its true and genuine meaning, is the soul and spirit of all law; positive law is construed, and rational law is made by it. In this, equity is synonymous with justice; in that, to the true and sound interpretation of the rule.' Hence Grotius has defined it to be the correction of that wherein the law, by reason of its generality, is deficient. It is applied to cases which the law does not exactly define, but which it submits to the sound judgment of the proper interpreter, *arbitrio boni viri permittit*. In this sense equity must have a place in every rational system of jurisprudence; if not in name, at least in substance. It is impossible that any code, however minute and particular, should embrace or provide for the infinite variety of human affairs, or should furnish rules applicable to all of them. Every system of laws must necessarily be defective; and cases must occur to which the antecedent rules cannot be applied without injustice, or to which they cannot be applied at all. It is the office, therefore, of a judge to consider whether the antecedent rule does apply, or ought, according to the intention of the lawgiver, to apply to a given case; and if there be two rules nearly approaching to it, but of opposite tendency, which ought to govern; and if there exist no exact rule applicable to all the circumstances, whether the party has no remedy, or the rule furnishing the closest analogy ought to be followed. The general words of a law may embrace all cases; and yet it may be clear that all could not have been intentionally embraced; for, if they were, it would defeat the obvious objects of the legislation. So words of doubtful import may be employed, and of a more or less extensive meaning. The question, in such cases, must be, in what sense the words were used; and it is the part of a judge to look to the objects of the legislature, and to give such a construction of the words as will further those objects. He is not at liberty to set aside the law, but to expound it. *Custos non conditor juris, juvare, supplere, interpretari, mitigare jus civile potuit; mutare vel tollere non potuit* (Taylor's Elements of Civil Law, 214). This is an exercise of equitable construction. It is the administration of equity. Hence arises a variety of rules of interpretation of laws according to their nature and operation, whether they are remedial or penal, or restrictive of general right, or in advancement of public justice. But this is not the place to consider those rules, or the application of them in different systems of law.

In the law of England equity has a different and more restrained meaning. We distinguish our remedies for wrongs, or for the enforcement of rights,

into two classes—those which are administered in courts of law, and those which are administered in courts of equity. The rights secured by the former are called *legal;* those secured by the latter are called *equitable.* The former are said to be rights and remedies at common law, because recognized and enforced in courts of common law. The latter are said to be rights and remedies in *equity,* because they are administered in courts of equity or chancery, or by proceedings in other courts analogous to those in courts of equity or chancery. Now, in England, courts of common law proceed by certain prescribed forms, and give a *general* judgment for or against the defendant. They entertain jurisdiction only in certain actions, and give remedies according to the particular exigency of such actions. But there are many cases in which a simple judgment for either party, without qualifications and conditions, and particular arrangements, will not do entire justice, *ex æquo et bono,* to either party. Some modification of the rights of both parties are required; some restraints on one side or the other; and some peculiar adjustments, either present or future, temporary or perpetual. Now, in all these cases, courts of common law have no methods of proceeding which can accomplish such objects. Their forms of actions and judgment are not adapted to them. The proper remedy cannot be found, or cannot be administered to the full extent of the relative rights of all parties. Such prescribed forms of actions are not confined to our law. They were known in the civil law; and the party could apply them only to their original purposes. In other cases he had a special remedy. In such cases where the courts of common law cannot grant the proper remedy or relief, the law of England authorizes an application to the courts of equity or chancery which are not confined or limited in their modes of relief by such narrow regulations, but which grant relief to all parties, in cases where they have rights, *ex æquo et bono,* and modify and fashion that relief according to circumstances.

The most general description of a court of equity is, that it has jurisdiction in cases where a plain, adequate, and complete remedy cannot be had at law, that is, in the common law courts. The remedy must be *plain,* for, if it be doubtful and obscure at law, equity will assert a jurisdiction. So it must be *adequate* at law; for, if it fall short of what the party is entitled to, that founds a jurisdiction in equity. And it must be *complete;* that is, it must attain its full end at law; it must reach the whole mischief, and secure the whole right of the party, now and for the future; otherwise equity will interpose, and give relief.

The jurisdiction of a court of equity is sometimes concurrent with that of courts of law, and sometimes it is exclusive. It exercises concurrent jurisdiction in cases where the rights are purely of a *legal* nature, but where other and more efficient aid is required than a court of law can afford to meet the difficulties of the case and insure full redress. In some of these cases courts of law formerly refused all redress, but now will grant it. But the jurisdiction having been once justly acquired at a time when there was no such redress at law it is not now relinquished. The most common exercise of concurrent jurisdiction is in cases of account, accident, dower, fraud, mistake, partnership, and partition. The remedy is here often more complete and effectual than it can be at law. In many cases falling under these heads, and especially in some cases of fraud, mistake, and accident, courts of law cannot and do not afford any redress; in others they do, but not always in so perfect a manner. A court of equity also is assistant to the jurisdiction of courts of law, in many cases, where the latter have no like authority. It will remove legal impediments to the fair decision of a question depending at law. It will prevent a party from improperly setting up at a trial some title or claim which would be inequitable. It will compel him to discover, on his own oath, facts which he knows are material to the right of the other party, but which a court of law cannot compel the party to discover. It will perpetuate the testimony of witnesses to rights and titles which are in danger of being lost before the matter can be tried. It will provide for the safety of property in dispute pending litigation. It will counteract and control or set aside fraudulent judgments. It will exercise in many cases an *exclusive* jurisdiction. This it does in all cases of merely *equitable rights,* that is, such rights as are not recognized in courts of law. Most cases of trust and confidence fall under this head. Its exclusive jurisdiction is also extensively exercised in granting special relief beyond the reach of the common law. It will grant injunctions to prevent waste or irreparable injury, or to secure a settled right, or to prevent vexatious litigations, or to compel the restitution of title-deeds; it will appoint receivers of property where it is in danger of misapplication; it will compel the surrender of securities improperly obtained; it will prohibit a party from leaving the country in order to avoid a suit; it will restrain any undue exercise of a legal right against conscience and equity; it will decree a specific performance of contracts respecting real estates; it will in many cases supply the imperfect execution of instruments, and reform and alter them according to the real intention of the parties; it will grant relief in cases of lost deeds or securities; and in all cases in which its interference is asked its general rule is that he who asks equity must do equity. If a party, therefore, should ask to have a bond for an usurious debt given up equity could not decree it unless he could bring into court the money honestly due without usury. This is a very general and imperfect outline of the jurisdiction of a court of equity, in respect to which it has been justly remarked that in matters within its exclusive jurisdiction, where substantial justice entitles the party to relief, but the positive law is silent, it is impossible to define the boundaries of that jurisdiction, or to enumerate with precision its various principles. Those who wish for more information on the subject may consult the elementary treatises of Fonblanque on Equity, Lord Redesdale's Treatise on Equity Pleadings, and Cooper's Equity Pleadings; and the Practical Treatises of Equity by Maddock and Jeremy. The equity jurisdiction in England is vested principally in the high court of chancery. See CHANCERY.

EQUITY OF REDEMPTION. Upon a mortgage, although the estate, upon nonpayment of the money, becomes vested in the mortgagee, yet equity considers it only a pledge for the money, and gives the party a right to redeem, which is called his *equity of redemption.* If the mortgagee is desirous to bar the equity of redemption he may oblige the mortgager either to pay the money or be foreclosed of his equity, which is done by proceedings in chancery by bill of foreclosure. See MORTGAGE.

EQUIVALENT. As the quantities by weight of bodies which combine with hydrogen, oxygen, and one another are fixed, there is always one simplest proportion in which they can be regarded as combining with or substituting one another. This quantity was called by Dalton the atomic weight, because he considered these proportions as the comparative weights of the atoms, or ultimate particles of the bodies. The term, however, was regarded as hypothetical, and both combining proportion and equivalent were proposed instead. The latter, which was

suggested by Dr. Wollaston, was accepted, and was till quite recently applied to elements and compounds. It has been shown, however, that quantities were thus styled equivalent, which were not so in any sense of the term. Thus, while one part by weight of hydrogen combines with 8 of oxygen, and 8 of oxygen with 14 of nitrogen, this quantity of nitrogen combines not with 1 but with 3 of hydrogen. Strictly, therefore, the quantity of nitrogen equivalent to 1 of hydrogen is $4\frac{2}{3}$. The older equivalent notation was consequently irregular and unsystematic, —equivalents being used in some cases but not in others. Hence has arisen the modern use of the word, in which it is expressly distinguished from the combining proportion or atomic weight. The latter is the number which best denotes the proportion in which the substance reacts chemically with all other bodies, and which is fixed by reference not to mere proportional weight, but also to vapour density, specific heat, crystalline form, diffusion, &c.; physical phenomena, in which certain relations are so constant that they presumably indicate natural laws. The former simply denotes the proportion by weight in which a body combines with or replaces a unit of hydrogen.

In some cases the equivalent coincides with the combining proportion, in others it does not. Thus they coincide in the case of fluorine, chlorine, bromine, iodine, lithium, sodium, potassium, silver, and one or two others. In general, however, the combining weight is some multiple of the equivalent; thus the combining weights of oxygen, sulphur, selenium, and a large number of the metals, are double their equivalents; of nitrogen and some others, three times; of carbon, tin, &c., four times, and so on. With regard to the total equivalency of some elements, chemists are not agreed, and indeed it may be questioned whether the whole doctrine is anything more than a vague hypothesis.

ERA. See EPOCH and ÆRA.

ERARD, SEBASTIEN, a celebrated musical instrument maker, born at Strasburg in 1752, went to Paris at the age of eighteen, and in concert with his brother, Jean Baptiste, produced pianofortes so superior to any that had previously been made in France that his fame quickly spread, and orders flowed in upon him from all quarters. During the revolution he came to England and established a manufactory in London, and when peace was restored his life was passed between that city and Paris. His improvements upon the harp, more especially that of the double movement, the principle of which he afterwards communicated to the piano, entitle him to high merit as an inventor. He died in 1831.

ERASISTRATUS, a celebrated Greek physician, said to have been grandson of Aristotle. He lived in the third century before the Christian era. He was the court physician of Seleucus Nicator, king of Syria, and has rendered himself famous by the sagacity with which he discovered the malady of Antiochus, the king's son. The king had married in his old age a beautiful lady, Stratonice, and the young prince fell madly in love with her, but preferred to pine away in silence rather than disclose his passion. Erasistratus resolved to save the prince, but this required delicate manœuvring. He went and told the king that his son was dying of a broken heart because an insuperable obstacle stood between him and the object of his passion. 'Who is the object of his passion?' inquired the king. 'My wife,' replied the physician; and as Seleucus implored Erasistratus to give up his wife to the prince Erasistratus asked the king if he would do so if he was so situated. 'Would to Heaven this were the case!' answered the king, 'I would not only give him Stratonice, but my whole kingdom, if that would save his life.' Then Erasistratus told the king the whole truth, and the prince was made happy in the possession of the fair Stratonice and several provinces of the empire. Erasistratus was munificently rewarded for his tact and sagacity. Shortly after this event he went to Alexandria, where he gave up practising as a physician and devoted himself to the study of anatomy. He was the first who systematically dissected the human body, and his description of the brain and nerves is much more exact than any given by his predecessors. He classified the nerves into nerves of sensation and of locomotion, and it is said had almost stumbled upon the discovery of the circulation of the blood. He was remarkably averse to blood-letting and the giving of purgatives, relying chiefly upon diet and regimen, bathing, exercise, friction, and the most simple articles of the vegetable kingdom, for the restoration and preservation of health. He wrote several works on anatomy, practical medicine, and pharmacy, of which only the titles remain, together with a great number of short fragments preserved by Galen and other ancient medical writers.

ERASMUS, DESIDERIUS, a celebrated scholar, was born at Rotterdam in 1467, being the illegitimate son of a Dutchman of Gouda, by name Gerard—of which Desiderius is the Latin, and Erasmus, or, more correctly, Erasmius, the Greek equivalent—and the daughter of a physician. He was a singing-boy in the Cathedral of Utrecht till his ninth year, then entered the school at Deventer, where he displayed such brilliant powers that it was predicted that he would be the most learned man of his time. After the death of his parents, whom he lost in his fourteenth year, his guardians compelled him to enter a monastery; and at the age of seventeen he assumed the monastic habit. The Bishop of Cambray delivered him from this constraint. In 1492 he travelled to Paris to perfect himself in theology and polite literature. He there became the instructor of several rich Englishmen, from one of whom—Lord Montjoy —he received a pension for life. He accompanied them to England in 1497, where he was graciously received by the king. He returned soon after to Paris, and then travelled into Italy to increase his stock of knowledge. In Bologna, where he received the degree of Doctor of Theology, he was one day mistaken, on account of his white scapulary, for one of the physicians who attended those sick of the plague; and, not keeping out of the way of the people, as such persons were required to do, he was stoned, and narrowly escaped with his life. This accident was the occasion of his asking a dispensation from the vows of his order, which the pope granted him. He visited Venice, Padua, and Rome; but brilliant as were the offers here made him, he preferred the invitation of his friends in England, where the favour in which he stood with Henry VIII. promised him still greater advantages. When he visited the lord-chancellor, Sir Thomas More, without making himself known to him, the chancellor was so delighted with his conversation that he exclaimed, 'You are either Erasmus or the devil.' He was offered a benefice, but was unwilling to fetter himself by an office of this kind. He was for a short time professor of Greek at Oxford. He afterwards travelled through Germany and the Netherlands, and went to Basel, where he had his works printed by Froben. He died in 1536. His tomb may be seen at Basel, in the Calvinistic cathedral.

To profound and extensive learning Erasmus joined a refined taste and a delicate wit. Naturally fond of tranquillity and independence, he preferred the pleasure of literary ease and retirement to the pomp of high life. His caution and worldly prudence offended

many of the best men of his times. He did great and lasting service to the cause of reviving learning. Although he took no direct part in the Reformation, and was reproached by Luther for lukewarmness, he attacked the disorders of monkery and superstition, and everywhere promoted the cause of truth. He wished for a general ecclesiastical council, to be composed of the most learned and enlightened men, but did not live to see his wish accomplished. He therefore confined his efforts to serve the world by his writings, which will always be prized for their interesting matter and graceful style. The best edition is by Le Clerc (Leyden, 1703, ten vols. folio). Besides his editions of various classics, the first edition of the Greek Testament from MSS. (with Latin translation), and his other philological and theological writings, we will only mention his well-known book in praise of folly, Encomium Moriæ, and his colloquies. His letters are very valuable in reference to the history of that period. Among the various biographies of Erasmus we may mention as one of the latest and best that by Robert B. Drummond (London, 1873, two vols.)

ERASTUS, the Latinized form of Lieber, or *beloved*, the learned name of Thomas Lieber, a German physician, who maintained the opinions from which the well-known epithet of *Erastian*, as now used, is derived. They are contained in a treatise of his on Excommunication, in which he declared that the church was entirely subservient to the civil power, and had no right to refuse the sacraments to, or pass ecclesiastical censures on any one, and that the secular magistrate had the entire and exclusive cognizance of all offences, civil and religious. In Scotland the term *Erastian* is applied to any person who denies the power of an established church to alter her own laws without the consent of the state, although the principles of Erastus have nothing whatever to do with such a question. Erastus was born at Baden, in Switzerland, in 1523, and was successively professor of medicine at Heidelberg, and of ethics at Basel, where he died in 1584.

ERASURE, or RASURE (Latin, *rasus*, shaved or scraped), in law, is the scraping or shaving of any deed or other instrument for the purpose of amendment or alteration. In England an erasure or interlineation is presumed in a *deed*, in the absence of rebutting evidence, to have been made before or at its execution; in a *will* it is presumed to have been made after its execution. Erasure in a deed, without consent of the party bound by it, will make it void. In Scotland it is inferred that all erasures and alterations have been made after the execution of the deed. Care must be taken in all cases that all words erased, deleted, altered, or added should be written in the margin, or in the body of the writing if before signature, and that such erasures and alterations be duly signed by the party bound, and by the witnesses.

ERATO (from Greek *eraō*, I love), one of the muses, whose name signifies loving, or lovely. She has much in common with Terpsichore—the same attributes, the same dress, and frequently a lyre and *plectrum*. She presides over the songs of lovers, and touches, as Ovid, in his Art of Love, informs us, the hearts of the coldest maidens by her tender lays. See MUSES.

ERATOSTHENES, a learned man in the times of the Ptolemies, born at Cyrene, in Africa, B.C. 276, was librarian at Alexandria, and improved the science of mathematical geography, which he corrected, enlarged, and reduced to system. He gained his greatest renown by his investigations of the size of the earth. He rendered much service to the science of astronomy, and first observed the obliquity of the ecliptic. Of the writings attributed to him one only remains complete,—Katasterismoi,—which treats of the constellations. Of his geographical works, which were long in high repute, the scattered remains were collected and published by Seidel (1798).

ERBIUM, along with yttrium and a number of other rare elements, occurs in some rare minerals, the chief sources being euxinite, fergusonite, and gadolinite, in which it exists as a silicate or tantalate. Its compounds were first distinguished by Mosander in 1843 from those of yttrium, while subsequent investigators have tried to show that no such bodies exist, but are mere mixtures of others. Recent examination of the subject has, however, established the existence of this element. Its separation from the minerals in which it occurs is an excessively laborious and difficult operation. It is obtained from gadolinite by decomposing with hydrochloric acid, precipitating with oxalic acid, dissolving in nitric acid, adding solid sulphate of potassium, filtering, and adding oxalic acid to precipitate the erbia and yttria. This process is repeated till the compound, examined by the spectroscope, is seen to be free from didymium. The erbium and yttrium nitrates are afterwards separated by repeated crystallizations.

Metallic erbium has not yet been obtained. Its oxide is a yellow or orange-coloured, or, according to others, a rose-red powder, remaining after ignition of the oxalate or nitrate. The hydrated oxide is a white gelatinous precipitate which absorbs carbonic acid from the air, and which readily dissolves in acids forming pink or rose coloured salts. They have an astringent taste.

Erbium compounds are especially distinguished by their spectra. When oxide of erbium is heated to a white heat, it emits an intense green light which, in the spectroscope, is found to be continuous, but intersected by a number of bright bands. In solution, however, erbium compounds absorb certain rays, and these are found to coincide with the lines of greatest intensity in the emission spectrum.

In this respect erbium resembles didymium (which see), but the spectra of the two bodies are absolutely different from one another.

ERCILLA Y ZUÑIGA, DON ALONSO DE, knight of the order of Santiago, and chamberlain to the Emperor Rudolph, the third son of a Spanish jurist, who was also a knight of the above order. When he was born is uncertain, but it was before 1540, most probably in 1533. His mother, from whom he inherited the name of Zuñiga, carried him, after the early death of his father, to the court of the Empress Isabella, consort of Charles V. The young Alonso was page to the Infant Don Philip, and accompanied him on his travels through the Netherlands and a part of Germany, and through Italy, Poland, Bohemia, and Hungary, and in 1554 went with him to England, on the occasion of his marriage with Queen Mary. Soon after this, an insurrection breaking out among the Araucanians, a tribe of Indians on the coast of Chili, Ercilla joined an expedition sent against them. The difficulties the Spaniards had to encounter, the heroic resistance of the natives, and the multitude of gallant deeds by which the war was signalized, inspired the young and brave Ercilla with the idea of making it the subject of an epic poem, to which he gave the name of La Araucana. He began the work on the spot, writing often during the night what had been achieved in the day ('now handling the sword, now the pen'), and was obliged sometimes, for want of paper, to use pieces of leather. Ercilla is said afterwards to have come near losing his life by reason of a groundless charge of mutiny, and to have been actually on the scaffold before his innocence was made known. He returned to Spain after

having finished the first part of his epic. All this he performed before completing his twenty-ninth year. In 1570 he married Maria Bazan at Madrid, whose charms and virtues are celebrated by him in various passages of his poem. In 1569 the first fifteen cantos of his poem, in 1578 a second, and in 1590 a third part were added, making in all thirty-seven cantos; he did not live, however, to complete the work. His merits were not rewarded; for he died at Madrid in great poverty and obscurity. The time and circumstances of his death are uncertain; he must have been alive, however, in 1596, as Mosquera, in his book on military discipline, speaks of him as his contemporary. He left no legitimate children.

The Araucana is an historical epic in the octave measure, in which the author confines himself, with the exception of some episodes and a few fictions, to the exact historical course of events. Hence the poem often assumes almost the character of a chronicle. Voltaire's judgment on this poem (in his Essai sur la Poésie épique) shows that he had not read it. Cervantes, in the sixth book of Don Quixote, ranks it by the side of the best Italian epics; but probably few persons, uninfluenced by patriotic pride, will agree with him. It has been continued by a certain Don Diego de Santisteban Osorio. Lope de Vega has taken from the epic of Ercilla the materials for his piece Arauca Conquered. The best editions are those published at Madrid in 1776 and 1828. It has been translated into Italian, and twice into French, but abridged (Paris, 1824). See ARAUCANIANS.

ERDMANN, OTTO LINNÉ. This distinguished chemist was the son of the physician who introduced vaccination into Saxony, and he was born at Dresden April 11, 1804. After his school instruction he was apprenticed to an apothecary, studied medicine, and devoted himself at last to chemistry. At the age of twenty-one he became a teacher, two years later extraordinary professor, and was finally appointed to the newly-founded chair of technical chemistry in Leipzig, which office he held till his death. As a teacher he excelled in the clearness and elegance both of his lectures and of his experimental illustrations, and had the power of creating and sustaining interest in his subject. His own researches embrace a wide range of subjects. He examined minutely the technology of nickel, and described some of its compounds; analyzed a number of minerals and slags, and experimented on several other points of inorganic chemistry. In organic chemistry his chief research is upon indigo, in the course of which he discovered isatin, but there are besides a great number of other researches, as upon colouring matters, sugar, butyric acid, phloridzin and salicin, &c. &c. The most important work in which he engaged was that upon the combining weights of several of the elements. In company with Marchand he made determinations of oxygen, carbon, hydrogen, sulphur, calcium, copper, mercury, and some others, and his numbers have been fully confirmed by subsequent experimenters. Erdmann was the author of a chemical text-book, and for many years conducted the Journal für technische und ökonomische Chemie, which was afterwards changed to the Journal für praktische Chemie, periodicals amounting to 100 volumes, the latter still occupying an important place. Besides his professional duties Erdmann found time for engaging in various concerns connected with the town of Leipzig, and his advice and knowledge thus became of use to his fellow-citizens more directly even than by his professorial instruction. He died October 9, 1869, after a painful illness.

EREBUS, in the Greek mythology, the son of Chaos and Darkness. He married his sister, Night, and was the father of the Light and Day. The Moirai, or Fates, by some are called his daughters. He was transformed into a river, and plunged into Tartarus, because he aided the Titans. From him the name Erebus was given to the infernal regions, particularly that part of it which is designated as the abode of virtuous shades, and from which they pass over immediately to the Elysian fields. Erebus is still sometimes used for the infernal regions.

ERECHTHEUS. See ERICHTHONIUS.

EREMACAUSIS, slow combustion (from Greek *ērēma*, gently, and *kausis*, burning), a term employed by Liebig to denote the gradual combination of the constituents of a combustible substance with the oxygen of the air. It is distinguished from fermentation by not apparently requiring contact with a ferment, that is, a substance undergoing decomposition, and maintaining it in others; and from putrefaction by both being unable to maintain itself without air, and to communicate its influence to other bodies. Under particular circumstances, however, decay may become putrescence, and putrescence decay, by altering the amount of air supplied. Eremacausis may take place either in nitrogenized or in non-nitrogenized matter, and a great number of actions are ascribed by Liebig to its influence. The conversion of alcohol into vinegar, of nitrogen into nitric acid, of wood into the brown substance called humus; the gradual oxidation of vegetable and animal tissues and fluids, the bleaching of cloth by exposure to light, air, and moisture, are all instances of this action. To produce it, however, certain conditions are necessary: moisture is required, and a definite temperature, which differs for different substances. This slow combustion, therefore, is prevented by lowering the temperature, excluding oxygen and water, and applying the ordinary antiseptics. That the action is really slow combustion is shown by different phenomena. If a decaying body be kept in contact with a limited amount of air the oxygen is slowly removed and carbonic acid and water are given off. If cloth be exposed too long in bleaching the fibre is gradually disorganized and converted into a humus-like substance. In eremacausis the oxygen of the air combines first with the hydrogen, and the carbon combines with oxygen already contained in the substance, and hence, as the decay advances, the residue becomes always richer in carbon, until at last either a nearly pure carbonaceous residue is left or a complex but stable compound containing carbon, hydrogen, and oxygen, incapable of being acted on by the air. In this kind of low combustion the heat given off may sometimes be hardly appreciable; but when it takes place through a large mass of matter, such as heaps of coal, cotton waste, especially when oily, lampblack, gunpowder-charcoal, the temperature is perceptibly higher than the air, and has often risen sufficiently to end in a regular combustion. Light is often perceived also on decaying wool and animal matter. When the decaying body contains nitrogen the phenomena are more complicated, and the substances obtained depend on the presence of alkalies or alkaline earths. Thus the nitrogen may be evolved as a gas, or it may be converted into ammonia, or it may be oxidized to nitric acid. Sometimes also the decaying body absorbs nitrogen or ammonia from the air, and gives rise to nitrogenized colouring matters. The whole subject of eremacausis is extremely imperfectly known, and it may be questioned whether there is any essential difference between it and other forms of decay.

EREMITE (from the Greek *erēmos*, a desert), one who secludes himself from society. See ANCHORITE.

ERFURT, an important fortress in Thuringia, in the Prussian province of Saxony, of which it is the capital. It is situated on the river Gera, and on the great road which leads from Frankfort-on-the-Main to the north of Germany, and is a station on the Frankfort and Dresden Railway. In the fifteenth and sixteenth centuries Erfurt was a flourishing commercial place, and contained not less than 60,000 inhabitants; the population in 1871 did not amount to more than 43,616, mostly Lutherans. The university, established in 1378, and long famous, was suppressed by the Prussian government in 1816. The town is surrounded by walls pierced for six gates, and is now a fortress of the first rank. Erfurt is the capital of a government of the same name, and the seat of several courts, and contains a Royal Academy of Practical Science, two gymnasia, an institution for the deaf and dumb, a musical society, and several other institutions. The manufactures consist chiefly of cotton, woollen, and mixed goods; leather, shoes, candles, ironmongery, vinegar, chicory, brandy, and liqueurs. The large bell called *Susanna*, made of the finest bell-metal, and weighing 275 cwts., is one of the curiosities of the place. It hangs in one of the towers of the cathedral, which is a fine old Gothic structure, well restored. The cell in which Luther lived while an Augustine monk, from 1505 to 1512, containing his Bible, portrait, &c., used to be shown. It was in the Martinsstift or orphan-house into which the old Augustine convent had been converted, but was destroyed by fire, along with the relics of Luther, in 1872. According to tradition Erfurt was founded as early as the fifth century, by a certain Erpes. It was not a free imperial city, but always maintained a sort of independence, notwithstanding the claims of the Elector of Mentz. In 1483 it concluded a treaty with Saxony, by which it agreed to pay an annual sum for protection. In the seventeenth century the Elector of Mentz obtained possession of it. The Congress of Erfurt (Sept.–Oct. 1808) was attended by Napoleon, Alexander of Russia, and many German sovereigns. In 1813 the town was taken by the Prussians, after a severe bombardment. In 1814 it was granted to that power by the Congress of Vienna. The government, of which it is the capital, contains 1263 square miles, with 369,497 inhabitants.

ERGOT is a diseased state of the grain of several cultivated grasses, particularly rye, which, when in this state, is commonly called *spurred* rye. At the beginning of the malady the ovary does not appear to be affected, retaining its colour, but being a little more tender than usual. The ovule is at that time white, but surrounded by a yellow viscid substance. It then swells immensely, bursts its integuments, becomes more or less elongated, with frequently a considerable curvature, according to the species of grass or corn which is attacked; sometimes projecting like a cock's spur (whence the name, which is French, and means in that language a cock's spur as well as the disease) far beyond the surrounding glumes, assuming a gray, brownish-purple, violet, or at length a black tint, and crowned frequently with the withered style and integuments carried up by the elongated ovule. Often only one or two of the grains on a spike are ergoted, the ovules of many being abortive, though the diseased structure has not been perfected. Great diversity of opinion existed as to the nature of this disease; it is now, however, universally recognized as due to the presence of a minute parasitical fungus, which causes a preternatural growth of the ovule. The rye ergot fungus is called the *Cordiceps purpurea;* its mycelium alone exists in ergot, but if the ergoted grains are sown the fungus develops itself in the perfect form, growing in little tufts from the surface of the ergot, with stem about ½ inch long, and subglobular head. When bread containing this substance has been eaten it produces serious consequences, sometimes gangrene of the extremities and death. Ergot is an important article in *materia medica*. It has been found capable of exerting a powerful and specific action upon the uterus, and is administered in small doses to hasten delivery in extreme cases.

Ergot has been repeatedly analyzed, and a variety of oily and ill-defined substances from it have been described. Among other things it yields trimethylamin when heated with potash or soda, and it has been specially attempted to prove that it contains an alkaloid as its active principle. A substance called *ergotin* has been mentioned by three different chemists, but their observations do not tally, and a second alkaloid called *ecbolin* still requires confirmation. According to the most recent account ergotin and ecbolin are brown, bitter, alkaline, amorphous powders, readily soluble in water and in alcohol, and forming amorphous salts. Their physiological action is doubtful. The preparations of ergot employed in medicine are all mixtures: they are the ethereal extract, a deep brown fluid; the alcoholic tincture, reddish brown; and the watery infusion.

ERIC. Fourteen kings of this name have reigned in Sweden, the last of whom ascended the throne on the death of his father, Gustavus Vasa, in 1560. He exhibited much energy of character, but drove his brothers to rebellion by his violence and severity. His tyranny and a disgraceful marriage with a Swedish peasant girl alienated the minds of his subjects; and his brothers, John and Charles, formed a party against him, which deprived him of the crown in 1568 with the consent of the states. He died (1577) in prison by poison. He was active and industrious. A patron of the arts, he esteemed and patronized artists and mechanics, received the Huguenots with open arms, abolished many superstitious usages in religion, and rendered commerce and navigation flourishing. His judicial institutions, too, are particularly worthy of praise. He created a high nobility in Sweden, by conferring the dignity of count and baron.

ERICACEÆ, a natural order of exogenous plants, deriving its name from its most extensive genus, the *Erica*, or heaths. The order consists of a very small number of trees, a great variety of shrubs and undershrubs, having their leaves alternate, opposite, or verticillate, generally evergreen and rigid. The calyx has four to five divisions, more or less deep; a monopetalous corolla, generally regular, with lobes alternating with those of the calyx; stamens definite, equal in number to the segments of the corolla or twice as many. Ovary free, surrounded at the base by a disk or scales. The fruit is capsular or baccate, and many celled. The order is unknown in very hot countries except at considerable elevations. The beautiful and showy plants belonging to this order may be found in exposed situations in South Africa, in America, Europe, and Asia. Several narcotic and poisonous plants belong to this order, such as *Rhododendron ponticum*, *Azalea pontica*, various Kalmias and Andromedas.

ERICHTHONIUS, or ERECHTHEUS, in fabulous history, the son of Dardanus and Bateia, and grandson of Zeus, was King of Troas. He was the richest man in his kingdom, having in his meadows 3000 mares with foals. Boreas fell in love with one of these mares, and transformed himself into a horse. The product of this union was twelve colts, which bounded over the plains without injuring a spire of grass, and skimmed the waves of the sea. Erichthonius obtained the Kingdom of Troy by the death of his brother Ilus without children. He married

Astyoche, the daughter of Simos, by whom (or according to some by Callirrhoë, the daughter of Scamander) he became the father of Tros.

Another ERICHTHONIUS, king of Athens, was, as fable relates, the son of Hephæstus and Atthis, daughter of Cranaus. Erichthonius was educated in the temple of Athena by the goddess herself. When he grew up he drove Amphictyon from his throne, and reigned in his stead. He erected a statue to Athena; or, according to some, a temple in the citadel, and instituted in her honour the festival called Panathenæa. The fabulous history of this Erichthonius is differently related. He is said to have had partly the form of a serpent.

ERIDANUS (probably the Po, in Italy, with which it was latterly identified), a river famous in mythology, mentioned in the return of the Argonauts. When Phaethon was struck by the thunderbolts of Zeus he fell into this river—and his three sisters, the Heliades, lamented him till they were changed into poplars. They did not cease to weep for him even in this condition; and their tears falling into the water of the river, became transparent amber.

ERIE, one of the great chain of North American lakes, between Lakes Huron and Ontario. It lies N.E. and S.W., between lat. 41° 30′ and 42° 52′ N.; and lon. 78° 53 and 83° 25′ W. It is about 265 miles long, 63½ miles broad at its centre, from 40 to 45 fathoms deep at the deepest part, and has an area of 9600 square miles. Its surface is 565 feet above sea level, and 30 feet below Lake Huron, which is 45 miles north from it. The whole of its southern shores is within the territory of the United States, and its northern within that of Upper Canada. It receives the waters of Lakes Superior, Michigan, Huron, and St. Clair, through the St. Clair and Detroit rivers at its south-western extremity, and discharges its waters into Lake Ontario by the Niagara River, at its north-east end. Several small islands are scattered over the west end of the lake; only one of which, Point Pele Island, is inhabited. This is the most dangerous of all the lakes to navigate in stormy weather, in consequence of the heavy ground-swell, proceeding from its shallowness. It has, however, owing to the construction of canals and railways, connecting its ports with the seaboard and the interior, a vast and increasing traffic, carried on both by steamers and sailing vessels. The banks vary in height; no portion of them, however, is above 100 feet high. The principal harbours on the Canadian side are Port Dover, Port Stanley, and Burwell; those on the United States side are Buffalo, Erie, and Cleveland. The present drainage of this lake by Niagara is not that which it had previous to the glacial period, the old valley by which it opened to the south-east towards the Hudson being still recognizable, though now choked up by boulder-clay.

ERIE, a town and port, United States, Pennsylvania, finely situated on Presquile Bay, on the southern shore of Lake Erie, 307 miles north-west of Philadelphia. The harbour is one of the best on the lake, and the trade of the place is considerable. Pop. 19,646.

ERIGENA, JOANNES SCOTUS, an eminent scholar and metaphysician, born about the beginning of the ninth century, whether in Ireland or in Scotland is uncertain. He spent a great part of his life at the court of Charles the Bald of France, and was placed at the head of the school of the palace. The king further imposed upon him the double task of translating into Latin the Greek works of the pseudo Dionysius the Areopagite, and of composing a treatise against Godeschalc, on Predestination and Free-will. This treatise, and another, De Divisione Naturæ, contained many views in opposition to the teachings of the church. They were condemned by the councils of Valencia in 855, and of Langres in 859, and Pope Nicholas I. demanded the immediate disgrace of the culprit. His subsequent history is not known, and the date of his death is variously stated at from 874 to 886. He has been confounded with John Scotus, an ecclesiastic who lived at the court of Alfred the Great, and who was placed by the king at the head of the newly founded college of Oxford. The doctrines which roused the ire of the church against Erigena are briefly as follows: Authority is derived from reason and not reason from authority; when they are conflicting authority is of no value. In his De Divisione Naturæ he divides nature into four categories: 1, God, who possesses and diffuses life; 2, the first causes, or eternal ideas by which he accomplishes his work; 3, the sensible world of creation, of which man is the summit; 4, God, as he shall at last be when the perfected world, its destiny being fulfilled, shall return to him. The pantheism lurking in the system was first clearly recognized in the thirteenth century by the Council of Paris.

ERINACEUS, a genus of animals, of which the hedgehog is the type. See HEDGEHOG.

ERINITE. This name has been given to two totally different minerals, both of them found in Ireland, and both of a green colour. One, very rare, found in Limerick, is a hydrated arseniate of copper, and consists of rough mammillated collections of fibrous and minute crystals. It is of a brilliant apple-green, is brittle, and is soluble in acids. Sp. gr. 4.

The other, found at the Giant's Causeway, is a silicate of aluminium, opaque and resinous, with colour varying from yellowish red to green. Specific gr. 2. It contains twenty-five per cent. of water, which it loses on heating, and it is classed by Thomson among the zeolites.

ERINNA, a Greek poetess who lived about the sixth century before the Christian era, and whose birth-place is variously stated. According to some she was a Lesbian, and the intimate friend of Sappho. Others aver that she was born at Teos, Rhodes, or Telos, and that she lived in the age of Demosthenes; while others again assert that there were two poetesses of the same name. She died at the age of eighteen, leaving behind her a few poems which were thought equal to those of Homer in point of merit. The chief of them was a work of about 300 lines, called Elakatē (The Distaff), of which nothing has come down to us. An epitaph or two which are still extant, and believed by some to be hers, are by others deemed spurious.

ERINNYES. See FURIES.

ERIOMETER (Greek, *erion*, wool, and *metron*, a measure), an instrument invented by Dr. Thomas Young for measuring the diameter of minute fibres (as those of wool) and globules (as those of blood). Its principle depends upon the fact that a portion of the shadows cast by these small objects, placed in front of a strong light, assumes the form of concentric circles of the different colours of the spectrum; the diameter of these circles being proportionate to that of the objects, and also to the distance of these from the surface on which the circles are formed. The instrument is thus described in Sir David Brewster's Optics: 'It is formed of a piece of card or brass plate, having an aperture of $\frac{1}{50}$ of an inch in diameter, in the centre of a circle of ½ inch in diameter, and perforated with about eight small holes. The fibres or particles to be measured are fixed in a slider; and the eriometer being placed before a strong light, and the eye being assisted by a small lens behind the hole, the rings of colour will be seen. The slider must then be drawn out or pushed till the limit of the first

red and green ring coincides with the circle of perforations, and the index will then show on the scale the size of the particles or fibres.'

ERIPHYLE, in fabulous history, daughter of Talaus, and wife of Amphiaraus, whom she betrayed for a necklace presented to her by Polynices, so that he was compelled to go to the war of the seven princes against Thebes, where he knew he was to perish. Her son, Alcmæon, slew her for her treachery; but Æsculapius restored her to life. The necklace was made by Hephæstus (Vulcan), and had the power of rendering whoever wore it unlucky.

ERIS, in heathen mythology, the goddess of discord, daughter of Night, and sister of Nemesis and the Parcæ or Fates; not being invited to the marriage of Peleus, she revenged herself by means of the *apple of discord*. See PARIS.

ERIVAN, a town, Russian Armenia, partly on a hill, and partly on the left bank of the Zengia or Sanga, 33 miles N.N.E. from the foot of Mount Ararat. The stream is crossed by a handsome stone bridge, but the town is very poorly built. The only buildings of note are several Armenian churches and mosques, a large bazaar, and a castle or palace crowning a height. The manufactures consist of cottons, earthenware, and leather; and the situation of the town, on the caravan route between Russia and Persia, gives it a considerable transit trade. Pop. 14,342.

ERLANGEN, a town Bavaria, circle Middle Franconia, in a plain not far from the Regnitz, 10 miles N.N.W. of Nürnberg, on the railway to Bamberg. The greater part of it having been consumed by a fire in 1706, it has been rebuilt in a much improved form. It is nearly of a square shape, is entered by seven gates, and its streets cross each other at right angles. The buildings most deserving of notice are the French, the town, and the German Reformed churches, the old castle, and the town-house, both forming part of the finest square which the town contains; the theatre, and the university, attended by about 250 students, provided with a good library and museum, and celebrated at present as a school of Protestant theology. The manufactures, which are numerous and important, owe their existence and prosperity to the French emigrants who found an asylum here after the revocation of the Edict of Nantes. The leading articles are mirrors, tobacco, hosiery, gloves, combs, &c. There are also a number of breweries. The environs are laid out in gardens and fine walks. Pop. 12,511.

ERLAU, or EGER, a town, Hungary, capital of county Heves, in a beautiful valley on the Eger, 65 miles E.N.E. of Pesth. It consists of the town proper, walled and entered by six gates, and of two suburbs, is the see of an archbishop, is generally well built, and has a handsome modern cathedral, several other churches, a ruined castle, which figured much in the wars with the Turks, an archiepiscopal palace, a lyceum, occupying the buildings of a former university, a diocesan seminary, a gymnasium, court-house, monastery, library, and hospital. The manufactures consist chiefly of woollen and linen cloth, hats, combs, leather, shoes, and harness. The finest red wines of Hungary are made from grapes grown in the neighbourhood. Two thermal springs, one on each side of the river, are well frequented. Pop. 19,150.

ERLKÖNIG, a mythical personage introduced into German poetry first through Herder's translation of a Danish ballad, Erlkönig's Tochter, and made familiar to all readers by Goethe's ballad, Der Erlkönig, or translations of it. This being is represented as exercising a malignant and fatal influence upon men, and especially children, by alluring promises or visions. The word is of Danish origin (*Ellerkonge*), and signifies elf-king.

ERMENONVILLE, a village in the department De l'Oise, about 8 leagues from Paris, celebrated for its large and handsome park, in which the remains of Rousseau were entombed upon an island of poplars, but from which they were afterwards removed to the Pantheon at Paris. In former days the fair Gabrielle d'Estrées resided at Ermenonville, in a hunting castle, of which a tower, still standing, bears the name of that favourite of Henry IV.

ERMINE (*Mustela erminea*, Linn.) This beautiful little animal belongs to the tribe Digitigrada, of the order Carnivora. It is found in the northern parts of Europe, Asia, and America, in great abundance; though it is not confined to these regions, since it occurs even in the middle states of America, and also in the temperate parts of Europe. In the middle and eastern states of America it is known as the *weasel*, further north, and in England, it is called *stoat* in its summer and *ermine* in its winter hair. In France, in summer, it is termed *roselet*, and in winter *hermine:* in this state it is the *Mus Ponticus* of Pliny. The habits of the ermine are very similar to those of the common weasel of Europe. It frequents barns and out-houses, generally making its retreats beneath the floor and rafters. It feeds on mice and rats, and soon clears its haunts of these pernicious depredators; but it does not always confine itself to this food. It is very destructive to poultry, birds, and young rabbits; it is also a great devourer of eggs. In the neighbourhood of Hudson's Bay ermine are very abundant, particularly in the barren grounds and open plains. When in pursuit of their prey they carry their tails horizontally, and display great quickness and agility. During the winter it is extremely difficult to distinguish them from their colour so closely resembling that of the snow. Like many other species of this genus, the ermine has the faculty of ejecting a fluid of a musky odour. In its summer dress it is of a light ferruginous or chesnut-brown colour over the head, back, sides, and upper half of the tail; the under part is nearly of a pure white; the lower portion of the tail becomes gradually darker, till, at the extremity, it is quite black. Its fur is short, soft, and silky. In its winter coat it is of a pure white over the whole head, body, and limbs, the lower half of the tail alone retaining its dark hue. The fur at this time is much longer, thicker, and finer than in summer. In Norway it is taken in traps baited with flesh; in Siberia it is either shot with blunt arrows, or taken in a trap made of two flat stones, propped by a stick, to which is fastened a baited string, which, on the least touch of the animal, releases the stone, which falls and crushes it. The fur of the ermine is in great request; it was formerly one of the insignia of royalty, and is still used by judges. When used as linings of cloaks the black tuft from the tail is sewed to the skin at irregular distances. This animal is not readily tamed; when caught, and kept in a cage, it exhibits every mark of its ferocious and savage character, by killing or injuring everything within its reach.

ERNE. See SEA-EAGLE.

ERNE, LOUGH, a lake, Ireland, county Fermanagh, consisting of a north or lower, and a south or upper lake, connected by a narrow winding channel, and properly forming only expansions of the river Erne. The upper lake, about 12 miles long by 2 miles broad, and from 3 to 12 fathoms deep, contains numerous small islands, but has tame and marshy shores. The lower lake, about 15 miles long by 5 miles broad, and in some places 37 fathoms deep, presents several bold and picturesque acclivities, some of them crowned with ruined castles. Both lakes are well-stocked with trout, salmon, pike, perch, bream, eels, &c., but owing to numerous shoals are navigated

only by flat-bottomed boats.—The River Erne rises in Lough Gounagh, in the county of Longford, flows N., traverses the county of Cavan, and falls into the Upper Lough Erne. It appears again at the north end of the lower lake, forming the outlet of both lakes, carrying their waters to Donegal Bay, below Ballyshannon, a distance of about 8 miles. A succession of falls occur from Balleck to Ballyshannon.

ERNEST AUGUSTUS, King of Hanover, known also by his title of Duke of Cumberland, was the fifth son of George III., and born on 5th January, 1771. He became a field-marshal in the British army, and in 1815, greatly to the indignation of his mother, Queen Charlotte, married, as her third husband, Princess Frederika Caroline of Mecklenburg-Strelitz. He took up his abode at Berlin, and resided there for a number of years, but returned to England while the discussions on Catholic emancipation were going on, and endeavoured by every means in his power to prevent the passing of that measure. On the death of William IV. in 1837 he ascended the throne of Hanover, in consequence of the succession to the sovereignty of that country being limited to male heirs. His arbitrary and tyrannical disposition, which had hitherto shown itself in opposing every step in the way of political reform and progress, was now manifested by his abrogating the constitution which had been granted in 1833. In 1848, however, he was compelled to accede to popular demands, and accord the nation a more liberal form of government. He died on 18th November, 1851, and was succeeded by his son, George V., the present king of Hanover. The unpopularity of the Duke of Cumberland in Britain was extreme, and the contingency of his succeeding to the throne was regarded as one of the greatest misfortunes that could befall the nation.

ERNESTI, JOHANN AUGUST, founder of a new theological and philosophical school in Germany, was born at Tennstadt, in Thuringia, 1707. He studied theology at Pforta, Wittenberg, and Leipzig. Having been made associate instructor (1731) and rector (1734) of the Thomas School in Leipzig, he devoted himself principally to ancient literature and the studies connected with it. In 1742 he was appointed extraordinary professor of ancient literature in the university there, and in 1756 ordinary professor of eloquence. In 1759 an ordinary professorship of theology was added to his other offices. He performed the duties of these professorships till 1770, when he resigned the former. He died first professor of the theological faculty in 1781. By a careful study of profane philology he had fitted himself for a thorough study of theology, and was thus led to a more judicious exegesis of the biblical writers, and, in general, to more liberal theological views. Theological criticism, so far as it is founded on philology and grammatical illustrations, was greatly promoted by him. Of his accuracy as a critic and grammarian, his editions of Xenophon's Memorabilia of Socrates, the Clouds of Aristophanes, Homer's Works, Callimachus, Polybius, Suetonius, Tacitus, and, above all, his admirable edition of Cicero's Works (first at Leipzig, 1738), are sufficient proofs. For the elegance of his Latin style he well deserves to be called the *Cicero of Germany*. Of his theological writings the ablest is his Institutio Interpretis Novi Testamenti (3d edition, 1775).—His nephew, AUGUST WILHELM (1733–1801), edited the works of Livy (1769), Ammianus Marcellinus (1773), and several other classical writers.

EROS, the Greek name of Cupid and Amor (which see; see also ANTEROS).

EROSION, geological phenomena due to the action of water, such as the hollowing out of river channels. It is well known that the smallest streams, when flowing over soft strata, scoop out channels and carry away the eroded material; and it is known from observation that huge masses of rock have been gradually worn away at the base, and in course of time have suddenly given way, often with disastrous consequences.

EROSTRATUS, an obscure Ephesian who, to perpetuate his name, set fire to the magnificent temple of Artemis (Diana), at Ephesus, on the night Alexander the Great was born (356 B.C.) The indignant Ephesians decreed that whoever pronounced his name would be put to death, a sure means of insuring his fame.

EROTIC (from the Greek *erōs*, love), relating to love.—*Erotic Poetry*, amatory poetry.—The name of *erotic* writers has been applied, in Greek literature, particularly to a class of romance writers, and to the writer of the Milesian Tales. These writers belong to the later periods of Greek literature, and abound in sophistical subtleties and ornaments. The best of them are Achilles Tatius, Heliodorus, Longus, Xenophon of Ephesus, and Chariton. There is a collection of them—Scriptores erotici Græci, Cura Mitscherlichii (Bipont. 1792–93, three vols.)

ERPENIUS, THOMAS (properly *Van Erpen*), a learned orientalist, was born at Gorkum, in Holland, in 1584, and studied at Leyden. His fame rests principally on his acquaintance with the oriental languages, which he began to learn under Joseph Scaliger. To extend his knowledge of them he visited England, France, Italy, and Germany, and became acquainted with the most eminent scholars. He was received with particular marks of friendship by the great Casaubon. He learned at the same time the Persian, Turkish, and Ethiopian languages. After a tour of four years he returned, in 1612, to Leyden, and was appointed professor of Arabic and other oriental languages. He established a press, at great expense, for the printing of works of oriental literature. In 1619 a second Hebrew professorship was founded at Leyden, and committed to Erpenius. Soon after he received the office of oriental interpreter to the states-general. The most learned Arabs admired the elegance with which he expressed himself in their language, so rich in delicate peculiarities. His reputation as a perfect master of the Arabic became universal, and he was repeatedly invited by the King of Spain to explain inscriptions on the Moorish buildings and monuments. The works of Erpenius (some of which were published after his death) are held in the highest estimation. It was his intention to publish an edition of the Koran, with a Latin translation and a commentary, a Thesaurus Grammaticus of the Arabic, and an Arabic dictionary; but he was carried off by a contagious disease in 1624, at the age of forty. Beside his Grammatica Arabica, his Grammatica Hebraica, and other grammatical works, his most valuable and celebrated publication is his Elmacini Historia Saracenica (1625, folio).

ERRATA (Latin, the plural form of *erratum*, an error), the list of errors and corrections placed at the end or at the beginning of a book. Before the invention of printing, and for a short time after it, the errata were corrected on the page where they occurred, but this was found to be inconvenient when the art became a little more developed. The first known example occurs in an annotated edition of Juvenal, published at Venice in 1478, which contains a list occupying two pages. The Vulgate, published in 1590, at Rome, by Sixtus V., and of which the proofs were revised by that pope himself, contains, instead of a table of errata, a bull which excommunicated those who would dare to make any alterations in the text. The book, however, was found to con-

tain so many blunders that it was afterwards suppressed, and the Papal bull had no other effect than that of amusing the learned and creating a demand for the copies still existing, some of which have been sold for about £50.

ERROR, in astronomy, is the difference between the places of any of the heavenly bodies, as determined by calculation and observation. Thus the error in the lunar tables is the difference between the place of the moon, as given in the tables, and as determined by observation; and this error is marked with the sign + or —, according as it is to be added to or subtracted from the tabular result.

ERSCH, JOHN SAMUEL, the father of modern German bibliography. He was born at Grossglogau, in Lower Silesia, June 23, 1766, and while a mere tyro showed uncommon love for bibliography. Being encouraged in this pursuit by Tabri and other learned men, he published the Repertory of the German Journals and other Periodical Collections of Information on the Subjects of Geography, History, and Sciences connected with them (1790–92, three vols.) Becoming known to Schutz and Hufeland, they engaged him in the editing of their Universal Repertory of Literature (1785–90). This work was published in 1793, and was followed in 1799 by the Quinquennium, extending from 1791 to 1795; and in 1806 by another, extending from 1796 to 1800. These works contain notices of all the separate publications which appeared during that period, and even all the essays printed in the journals and other periodicals. They are executed with accuracy, on a good plan, and with a general account of reviews, whose character for partiality or impartiality is illustrated by examples. At the same time Ersch began to prepare a Universal Dictionary of Modern Authors, which he afterwards limited to European writers. This was the origin of his Gelehrtes Frankreich (Literary France) (Hamburg, 1797–1806, three vols., with two supplements). In the year 1803 he was made professor of geography and statistics in the University of Halle, where he published his Manual of German Literature from the Middle of the Eighteenth Century till the Latest Times (Amsterdam and Leipzig, 1812, two vols. 8vo; 2d edition, Leipzig, 1822), and in connection with Gruber, the Universal Encyclopædia of Arts and Sciences (Leipzig, 1818, et seq. 4to). By the former work he first gave a systematic character to modern German bibliography; and its completeness, accuracy, and arrangement make it a model for such a work. What knowledge, what attention and industry are requisite to conduct a work like the Encyclopædia, as he has done it, needs no explanation. He died in January, 1828.

ERSE. See GAELIC.

ERSKINE, EBENEZER, the founder of the Secession Church in Scotland, was born on the 22d of June, 1680, and died in 1756. After going through a regular course of study at the University of Edinburgh he was ordained minister of Portmoak, in Fife, in 1703, in which situation he continued for twenty-eight years, when he removed to Stirling. Five volumes of his sermons were printed in 1762 and 1765, 8vo. Regarding his participation in the origin of the Secession Church, the reader is referred to the article SECESSION.—His brother RALPH was born in 1685, and died in 1752. He was minister of Dunfermline, in Fifeshire, from 1711 to 1734, when he was ejected for secession. His sermons are numerous, and together with his lyrical effusions called Gospel Sonnets, were printed in 1750, in two vols. folio. The latter have been often reprinted.

ERSKINE, THE HON. HENRY, a distinguished Scottish barrister, was the third son of Henry David, tenth earl of Buchan, and was born at Edinburgh on the 1st of November, 1746, o.s. After studying at the universities of St. Andrews, Edinburgh, and Glasgow, he adopted the legal profession, and in 1768 was called to the bar. There he was equalled, perhaps surpassed in depth of legal knowledge, by one or two of his fellows; but none could boast of equal variety and extent of accomplishments; none surpassed him in knowledge of human character; and none equalled him in quickness of perception, playfulness of fancy, and professional tact. Yet while, by the unanimous suffrages of the public, Mr. Erskine found himself placed without a rival at the head of a commanding profession, his general deportment was characterized by the most unaffected modesty and easy affability, and his talents were not less at the service of indigent but deserving clients, than they were to be commanded by those whose wealth or influence enabled them most liberally to remunerate his exertions. He had early embraced the principles of whiggism; and on the accession of the Rockingham administration his merits pointed him out as the fittest member of faculty for the important office of lord-advocate of Scotland, to which he was immediately appointed. But his opportunities to support the new administration were few, on account of its ephemeral existence; and on its retirement he was immediately stripped of his official dignity, and even some years afterwards deprived, by the vote of his brethren, on account of his obnoxious political sentiments, of the honourable office of dean of faculty. On the return of the Liberal party to office in 1806 he once more became lord-advocate, and was returned member for the Dumfries district of burghs. This, however, like the former Whig administration, was not suffered to continue long in power, and with its dissolution Mr. Erskine again lost his office and seat in Parliament. His constitution began to give way under the pressure of disease about the year 1812; and he thereupon retired from professional life to his beautiful villa of Ammondell in West Lothian. The five remaining years of his life were consumed by a complication of maladies; and he expired at his country-seat on October 8, 1817, in his seventy-first year.

ERSKINE, JOHN, of Carnock, afterwards of Cardross, a celebrated Scottish jurist, was born in 1695, was trained for the legal profession, and became a member of the faculty of Advocates in 1719. He continued for some years to discharge his professional duties with much success. In 1737 he was chosen as successor to Alexander Bain in the professorship of Scots law in the University of Edinburgh. In 1754 he published his Principles of the Law of Scotland, which he intended chiefly for a text-book for his students, in place of Sir George Mackenzie's Institutions hitherto used for this purpose. The book is highly esteemed on account of the precision, accuracy, and at the same time conciseness with which the principles of the law are stated. After a professional career of twenty-eight years he resigned and retired from public life. For three years after his resignation he occupied himself chiefly in preparing his more important work, the Institute of the Law of Scotland, for publication. At his death in 1768, however, the work was not completed. It was put into the hands of one of his legal friends, who, with the aid of some of his associates at the bar, brought it out in 1773. It is remarkable for the same accuracy and caution as the Principles, and as additions have been made in every subsequent impression, suitable to the changes in the law, the work still enjoys a high reputation, and is often referred to as an authority.

ERSKINE, THOMAS, Lord Erskine, the youngest son of David Henry tenth earl of Buchan, and

brother of Henry Erskine, the witty lord-advocate. He was born in the year 1750, and was educated partly at the High School of Edinburgh, and partly at the University of St. Andrews. The contracted means of his family rendering a profession necessary, he was embarked at Leith as a midshipman, and from this time did not revisit Scotland until a few years before his death. He never obtained a commission in the navy, which he quitted after a service of four years, and entered into the Royals, or 1st Regiment of Foot, in 1768. In 1770 he married, and went with his regiment to Minorca, where he spent three years. He served in the army six years, and during that time acquired considerable reputation for the acuteness and versatility of his talents in conversation; and it is supposed that this circumstance, and the earnest persuasion of his mother—a lady of uncommon acquirements and penetration—induced him, at the age of twenty-six, to embrace the legal profession. He entered as a fellow commoner at Trinity College, Cambridge, in 1777, merely to obtain a degree, to which he was entitled as the son of a nobleman, and thereby to shorten his passage to the bar; and he at the same time entered himself a student of Lincoln's Inn. He also became a pupil in the office of Mr. (afterwards Judge) Buller, then an eminent special pleader, and subsequently in that of Mr. (afterwards Baron) Wood. He was called to the bar in 1778, and his success was immediate. In May, 1783, he received a silk gown, and the same year was elected member of Parliament for Portsmouth. The latter honour he acquired from the reputation he obtained there when acting as counsel on the celebrated trial of Admiral Keppel; and he was unanimously rechosen for the same borough on every succeeding election, until raised to the peerage. The rights of juries he firmly maintained on all occasions, but particularly in the celebrated trial of the Dean of St. Asaph for libel, when Justice Buller refused to receive the verdict of 'guilty of publishing only,' as returned by the jury. In 1789 he found another fortunate opportunity for the display of his peculiar eloquence, in a defence of Mr. Stockdale, the bookseller, for publishing what was charged as a libellous pamphlet in favour of Warren Hastings, whose situation at the time (being then about to take his trial) gave him admirable scope for the animated appeal to feeling, by which his oratory was so felicitously distinguished. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his Rights of Man, he declared that, waving all personal convictions, he deemed it right, as an English advocate, to obey the call: by the maintenance of which principle he lost his office of attorney-general to the Prince of Wales. The most arduous effort, however, in his professional life, arose out of the part cast upon him, in conjunction with Mr. (afterwards Sir Vicary) Gibbs, in the trials of Hardy, Tooke, and others, for high treason, in 1794. These trials lasted for several weeks; and the ability displayed by Erskine on this eventful occasion was admired and acknowledged by all parties. He was a warm partisan of Fox, and a strenuous opposer of the war with France; on which subject he embodied his sentiments in a pamphlet, entitled A View of the Causes and Consequences of the War with France; when such was the attraction of his name, that it ran through the unprecedented number of forty-eight editions. In 1802 the Prince of Wales not only restored him to his office of attorney-general, but made him keeper of his seals for the duchy of Cornwall. On the death of Pitt, in 1806, when Lord Grenville received the commands of George III. to form a new administration, Erskine was created a peer by the title of Lord Erskine, of Restormel Castle, in Cornwall, and raised to the dignity of Lord High-chancellor of Great Britain; but was soon removed by the dissolution of the brief administration of which he formed a part. In his leisure he amused himself by editing several of the state trials. The preface to Fox's Speeches was also written by him, as well as a political romance, in two volumes, entitled Armata, and some pamphlets in support of the Greek cause. He died in 1823 of an inflammation of the chest.

The talents of Lord Erskine were peculiarly those of the accomplished advocate; as a senatorial orator his claims were but secondary; nor as a political writer is he entitled to much distinction. Many of Erskine's speeches at the bar have been published under the following titles: Speeches of the Hon. Thomas Erskine, now Lord Erskine, when at the Bar, on Subjects connected with the Liberty of the Press and against Constructive Treason, in four vols. (second edition, London, 1813); and Speeches of Lord Erskine, when at the Bar, on Miscellaneous Subjects (1810), by Ridgway.

ERUPTION, in medicine, a sudden and copious excretion of humours, and the same with *exanthema*, or breaking out; as the pustules of the plague, smallpox, measles, &c.

ERYNGO (*Eryngium*), a genus of plants belonging to the natural order Umbelliferæ. The species are herbaceous, and have something of the aspect of the thistle. *E. maritimum*, sea-holly, is our only truly native species. It frequents sandy shores, and is distinguished from other plants of the order by its rigid, spiny, glaucous, veined leaves, and its dense heads of blue flowers. The roots are sometimes candied, and are reputed to be stimulating and restorative. The *E. campestre* was formerly much employed in Europe as a tonic, and as tending to excite appetite; but its virtues are feeble, and it has now gone out of use, except as a preserve.

ERYSICHTHON, or ERESICTHON, in fabulous history, the son of Triopas, king of Thessaly. He attempted to cut down a grove sacred to Demeter (Ceres). Beginning with a large and beautiful oak, the abode of one of the dryads, under the shade of which the rest of the dryads commonly celebrated their dances, in spite of all previous warnings, in spite of the blood of the nymph, which flowed from the first stroke, he would not relinquish his design till the oak fell, and its spiritual inhabitant was deprived of life. The rest of the dryads now fled to Demeter and implored vengeance. The goddess despatched the demon of hunger, which overshadowed Erysichthon with its wings while he slept, and breathed into him its poisonous breath. From this moment a continual craving for food raged within him. He soon consumed all his possessions, and when food could no longer be procured for him by the art of his daughter, who had many times sold herself for a slave from love to him, and escaped from her purchasers by her power of assuming different forms, which she had received from Poseidon, he devoured his own limbs, as far as he could reach them, and died in a dreadful state of despair.

ERYSIPELAS (from Greek *eruō*, I draw, and *pelas*, adjoining; named from the neighbouring parts being affected by the eruption), the rose, or St. Anthony's fire. This disease is an inflammatory affection, principally of the skin when it makes its appearance externally, and of the mucous membrane when it is seated internally; and is more liable to attack women and children, and those of an irritable habit, than those of a plethoric and robust constitution. Erysipelas sometimes returns periodically, attacking the patient once or twice a year, or even once

every month; and then, by its repeated attacks, it often gradually exhausts the strength, especially if the patient be old and of a bad habit. Every part of the body is equally liable to it; but it more frequently appears on the face, legs, and feet than anywhere else, when seated externally. Erysipelas is of two kinds, viz. *traumatic* and *idiopathic*. The former is that which follows wounds, and commences at the seat of injury; the latter is due to internal causes. The integuments of the face and hands are most commonly the seats of idiopathic erysipelas, while the other may appear in any part of the body. There can be little doubt that this disease is a miasmatic disorder, due to the absorption of a specific poison. The miasm is most commonly generated in wards of hospitals which are over-crowded by patients having unhealthy discharges. This poison may, and often does, give rise to puerperal fever in lying-in women.

ERYTHRIC ACID, or ERYTHRIN, is got from *Roccella tinctoria*, from other lichens used for archil or cudbear (see these words), by exhausting with boiling water, allowing to cool, and purifying the crystalline powder by solution in hot alcohol. It is a white, crystalline, tasteless, and odourless powder, readily soluble in alkalies, alcohol, &c., not so readily in water. Its exact formula is not determined, but $C_{20}H_{22}O_{10}$ is usually accepted. It is decomposed by heat, and is altered by boiling with water and alcohol, yielding pikroerythrin, erythrit, orsellinic acid, and orcin. It is commonly called a very weak acid, forming feeble compounds with the alkalies, and reacting with salts of iron, lead, and one or two more of the metals; but in reality it is not an acid at all, but a compound ether derived from orsellinic acid and erythrite.

ERYTHRINE, a name given to cobalt bloom, from its carmine or peach-blossom colour. It consists of arseniate of cobalt, but contains considerable quantities of nickel, iron, and water. It is soluble in acids, and fuses readily in the blowpipe flame. It is found both in small crystals belonging to the oblique system and in masses; the colour varies from red to white or greenish gray, and when dry deep blue; translucent or transparent. Specific gravity 3. Its English localities are Cornwall and Cumberland; it is also met with in different parts of the Continent. It is used for conversion into smalt (which see).

ERYTHRITE, a flesh-coloured mineral found at Kilpatrick and Bishopton, analyzed by R. D. Thomson, and supposed by him to be allied to felspar.

ERYX, a city and mountain in the west of Sicily, about 6 miles from Drepanum, and 2 from the seacoast. The mountain, now Monte San Giuliano, rises direct from the plain, unconnected with any other range, and hence possesses a much greater altitude in appearance than in reality, its height being only 2184 feet. It was anciently believed to be the highest mountain in the island after Etna, and is frequently alluded to by Virgil and other poets. On the summit stood a celebrated temple of Venus, from which the goddess received the epithet of *Venus Erycina*. All traces of the ancient town of Eryx have now disappeared, and its site is occupied by the modern town of San Giuliano; but some remains of the temple still exist in part of the substructure of the castle.

ERZERUM, ERZEROUM, or ERZEROOM, a city of Turkish Armenia, capital of a pashalic to which it gives name; near the head of the Euphrates, on a rising ground at the base of a chain of mountains, which are usually covered with snow, 166 miles N.N.E. of Diarbekir. It consists partly of an inner portion, near the centre of which stands the citadel, surrounded by a double stone wall, but almost ruinous, and of several extensive suburbs. Many of the houses are substantial, though a number of them are more indicative of ancient than of existing splendour; the streets are almost without exception narrow, dark, and filthy in the extreme. The principal edifices are about forty mosques, including one that was originally a Christian church, all situated in the citadel, several Armenian churches, numerous elegant caravansaries, and very extensive and well-furnished bazaars. The inhabitants, who number about 40,000, consisting of Turks, Armenians, and Persians, are very industrious; and, in addition to important manufactures, especially in copper and iron, carry on a very extensive trade. This is greatly favoured by the position of the town, standing at the junction of several important roads leading from Transcaucasia by way of Trebizond, and communicating with different parts of Asia Minor, with Persia, Kurdistan, Mesopotamia, &c. In 1871 the amount of British goods imported was estimated at £221,000. Erzerum is a place of so very great antiquity that its origin is lost in fable. Anatolius, commander of the Emperor Theodosius II., here built the citadel of Theodosiopolis, north-west of the open Syro-Armenian trading town of Arsen. On the destruction of this town by the Seldjuks, in 1049, the inhabitants removed to Theodosiopolis, which received from them the name of Arsen-er-Rum, that is, Arsen of the Romans. Hence the modern name Erzerum. In 1241 it fell into the hands of the Mongols, and in 1517 into those of the Turks, notwithstanding whose mismanagement it continued to be the most important commercial emporium of the Armenian plateau, and had a population of 100,000. In 1829 it was taken by the Russians, but was restored to Turkey by the Peace of Adrianople. Many of the more intelligent and industrious inhabitants, however, quitted the town and settled on the Russian territory. In 1859 Erzerum severely suffered from an earthquake.

ERZGEBIRGE (Ore Mountains), a chain of mountains running between Saxony and Bohemia, till they meet the Riesengebirge, on the frontiers of Silesia. The highest summits, which are on the side of Saxony, rise to 3800 or 3900 feet above the level of the sea. The Erzgebirge consist chiefly of gneiss and granite formations, and in this the principal beds of ore are to be found. Masses of porphyry and basalt are found on and in this formation. Towards Saxony beds of clay slate rest on the granite and gneiss; and above the clay slate are granite and syenite. Towards Bohemia the primitive formation is covered for a considerable extent by brown coal mountains, and the remainder by clay slate. These mountains are rich in mines of silver, iron, copper, lead, cobalt, arsenic, &c.

ESAU, the eldest son of Isaac, and twin-brother of Jacob (Gen. xxv. 24–26). His name (which signifies rough, hairy) was due to his singular appearance at birth, being 'red, and all over like an hairy garment.' The struggle for precedence between the brothers was foreshadowed the moment of their first appearance in the world. The two boys grew up, and the disparity of their tastes was soon apparent. Esau, the father's favourite, became a cunning hunter; Jacob, the favourite of the mother, became a peaceful shepherd. One day, as Esau returned famished from the chase, he found his brother preparing some lentil pottage, and asked for a share of it. Jacob, taking advantage of his brother's distress, offered him the pottage if he would give up his birthright. This meant yielding up the headship of the tribe and the greater share of the family property, but Esau was so exhausted that he consented. He was named Edom (red) in consequence, from the colour of the pottage; and the name was given to the land

he settled in. Esau married at the age of forty; and, against the wishes of his parents, took both his wives from among the daughters of Heth, of the Canaanite tribe. The next episode in his history is when Jacob, instigated by his mother, personates Esau, and by a series of lies, and the offering of savoury food, which the now infirm and blind old man loved, succeeded in getting his father's covenant blessing. The indignation of Esau at the base trick was natural; and Rebekah sent Jacob out of the way for a time, to escape his brother's vengeance. On his return from a protracted stay Jacob met his brother at the head of 400 warriors, and succeeded in mollifying him by presents and flattery. After a subsequent meeting of the brothers, on the death of their father, we hear no more of Esau.

ESCALADE, in war, a furious attack of a wall or a rampart, carried on with ladders, to pass the ditch or mount the rampart, without proceeding in form, breaking ground, or carrying on regular works to secure the men.

ESCAPE, in law, is where a person arrested gains his liberty before he is delivered by law. Escapes are either in civil or criminal cases; and may be distinguished into voluntary and negligent; voluntary, where it is with the consent of the keeper; negligent, where it is for want of due care. In civil cases, after the prisoner has been suffered voluntarily to escape, the sheriff can never after retake him, and must answer for the debt; but the plaintiff may retake him at any time. In the case of a negligent escape, the sheriff, upon fresh pursuit, may retake the prisoner, and the sheriff shall be excused if he has him again before any action is brought against himself for the escape. In criminal cases, an escape of a person arrested is an offence against public justice, and the party is punishable by fine and imprisonment.—An *escape warrant* is an instrument addressed to all sheriffs, &c., to arrest and commit to proper custody any person who may have escaped from prison.

ESCAPEMENT, in clock and watch making, the apparatus which connects the train of wheels with the regulator (the pendulum of a clock or the balance-wheel of a watch), and serves to arrest at each instant the onward motion. The *crown-wheel* or *verge* escapement is the oldest form, and is still used in common watches. It consists of a *scape-wheel* (the last wheel in the train), with saw-like teeth rising upwards from the plane of the wheel, and fitting into two pallets attached to the verge or arbor of the balance; these pallets being placed at a distance from each other equal to the diameter of the balance-wheel, and in different planes, receive alternately from the scape-wheel an impetus in opposite directions, which keeps up the vibratory motion of the balance. The *crutch* or *anchor* escapement, introduced into the art of clockmaking in 1680, by Clement, a London maker, consists of a piece of metal shaped like an anchor, with pallets at each end fitting into the scape-wheel. This anchor is attached to the rod of the pendulum, and moves with it; and the pallets are so arranged that the one tooth escapes from contact with the inside of one pallet while the tooth on the opposite side is brought to bear on the outside of the other. The *dead-beat* escapement, invented by Graham, is a modification of this form, in which the pallets are so placed that the outer surface of the one and the inner surface of the other are arcs of circles whose centre is the pivot on which the anchor works. Other inventions, such as the *detached* escapement, the *pin-wheel* escapement, in various forms, and the *gravity* or *remontoir* escapement (in the great clock in the Houses of Parliament), though very efficient, have not yet come into general use, partly owing to complexity introduced into the movement, the extreme delicacy of the work not adapting it to the jostlings of every-day wear, and partly owing to the great expense in repairing the movement when it gets out of order.

ESCHEAT, in law, a species of reversion arising from default of heirs: when the tenant dies without lawful or natural born relations on the part of any of his ancestors, or on the part of those ancestors from whom the estate descended, or where the intestate tenant, having been a bastard or denizen, does not leave any lineal descendants, the estate reverts back to the original grantor or lord of the fee. Escheat also arose from corruption of blood, when the tenant had been attainted of treason or murder; this is now abolished by 33 and 34 Vict. cap. xxiii., and now a descent can be traced through an attainted ancestor. Escheat, in Scotland, is of two kinds:—1. The forfeiture of all heritable and movable property to the crown, in case of treason; 2. The forfeiture of goods by a debtor, who has failed to make payment of debt in obedience to legal diligence. This last species is now abolished. Single escheat (that is, the forfeiture of movable goods) still exists in Scotland, as a punishment of crime.

ESCHENBACH, WOLFRAM VON, who flourished in the first half of the thirteenth century; one of the most voluminous and also one of the most distinguished German poets of the Suabian period. Of a lively imagination and penetrating spirit, rich and original in his descriptions, and a complete master of language and versification, he elevated himself to a high rank among epic poets. Nothing is known of his private circumstances, except that he belonged to a noble family, probably in the Upper Palatinate. He was knighted at Heaneberg, and passed his life in the performance of the duties of chivalry, being supported by his poetical genius and the liberality of princes. He distinguished himself among the minnesingers of the Wartburg. Towards the end of his life he returned to the castle of his fathers, and was buried in the church of Our Lady of Eschenbach. His poems are partly original, and partly imitated from the French and Provençal literature. The most esteemed of his numerous works are: The Parzival (printed 1477, 4to, found also in Müller's Collection); the Titurel, or the Guardian of the Graal, called the Older Titurel, to distinguish it from a later poem of the same name (printed in 1477, 4to); and the Willehalm, a poem on the deeds of William of Orange, a contemporary of Charlemagne. Lachmann's is an excellent edition of the complete works of Wolfram.

ESCHWEGE, a town of Prussia, in the province of Hessen-Nassau, in a beautiful valley on the Werra, 26 miles E.S.E. of Cassel. It is a walled and well-built town, with a castle, long the residence of the landgraves of Hessen-Rotenberg; three churches, a townhouse, and infirmary, manufactures of woollen and linen cloth, several large tanneries and glue-works, oil and other mills, and a trade in meal, fruit, lard, ham, and sausages. Pop. 7377.

ESCHWEILER, a town of Prussia, in the province of Rheinland, 9 miles E.N.E. of Aix-la-Chapelle, at the confluence of the Inde and Dente, and on the railway to Cologne, with manufactures of woollen, velvet, and silk goods, lace, leather, vinegar, and vitriol, a large machine factory, glass-works, smelting furnaces, malleable and other iron-works. Calamine and lead, as well as coal, are worked in the vicinity. Pop. in 1871, 15,550.

ESCORT, a guard, a body of armed men which attends an officer or baggage, provisions or munitions conveyed by land from place to place, to protect them. This word is sometimes used for naval protectors; but the proper word in this case is *convoy*.

ESCURIAL (*el Escorial*), a royal palace of Spain, distant from Madrid about 24 miles in a north-westerly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. The Escurial is not a mere palace, but a memorial building, and combines a monastery and a chapel with a royal palace. Everything about the Escurial—situation, plan, and purposes — bears the stamp of the singular and unpractical mind of its originator, Philip II. Not the least remarkable of its peculiarities is its site. Away from cities, amid the seclusion of mountain scenery, it rises at a height of 2700 feet above the level of the sea. Of its site Thomas Roscoe says, 'Secluded in a recess of these savage mountains, midway up their steep acclivity, it seems to be one of those edifices raised by enchantment in unfrequented spots to amaze and bewilder the traveller. Yet it is not out of harmony with the scene. Gloomy in its site, it is itself gloomy, and calculated to beget that feeling in all who behold it. From a distance it looks like a forest of domes, towers, spires, and pinnacles.' Among the singularities of the Escurial, its origin and plan require particular notice. It was built by Philip II. in commemoration of the battle of St. Quentin. This battle was fought on the festival of St. Lawrence, 10th August, 1557, and the Escurial was built in honour of the saint, in consequence, it is said, of a vow made by Philip previous to the battle. 'He who made so great a vow,' said the Duke of Bragança, 'must have been very much frightened.' In carrying out his vow Philip had the whimsical notion of making the Escurial resemble the instrument of torture wherewith, according to legend, St. Lawrence was martyred—a gridiron. He appropriated, according to Roscoe, 'to himself the handle, and the remainder to the monks, to intimate possibly that he would much rather they should be grilled than he.' The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts, which represent the intersections of the bars of the gridiron; while a projection 460 feet in length, representing, as has been said, the handle, contains the chapel and the royal palace. The building was begun in 1563 by Manegro, a Toledan architect, and finished in 1584 by his pupil Juan de Herrera. It is irregular in its proportions, and thus loses much of the effect which, from its great magnitude, it ought to have. 'The height,' says Roscoe, 'is 51 feet 8 inches to the cornice by exact measurement (less than a fourteenth of its length), which gives it the appearance rather of the side of a street than of the façade of a palace.' At the extremities are towers 200 feet high, supposed to represent the feet of the gridiron, and the cupola of the church has a height of 330 feet. It is to these features that it owes an imposing architectural appearance. The innumerable windows (said to be 11,000 in honour of the Cologne virgins) give it the aspect of a large mill or barrack. The doors are also numerous. The church is a Greek cross with three naves. The material of the building is gray granite found in the neighbourhood, which preserves its fresh and clean appearance. Under the church is the Pantheon or burying-place of the kings of Spain, on the door of which is a Latin inscription intimating its purpose. Its interior is lined with dark marble beautifully veined. The monasterial part of the building contains a valuable library, especially rich in Greek and Arabic manuscripts, and there is a superb collection of pictures scattered through various parts of the building. Raffaele, Titiens, Rubens, Velasquez, Guido, and other great masters are here represented. During the French occupation the books, 30,000 in number, were removed to Madrid, but were sent back by Ferdinand minus 10,000 volumes.

We have described the Escurial in the present tense, but the description applies rather to the past than the present. It was partly burned in 1671, when many MSS. were destroyed, and was pillaged by the French in 1808 and 1813. It was restored by Ferdinand VII., but the monks, with their revenues which supported it, have long since disappeared, and the building, which from its situation requires to be kept in repair at considerable expense, is going to decay, which is only retarded by occasional grants of public money. The full name of the Escurial is *El Real Sitio de San Lorenzo el Real de Escorial*. On 2d October, 1872, the Escurial was struck by lightning, and was in consequence seriously injured by fire.

ESCUTCHEON, in heraldry, is derived from the French *écusson*, and that from the Latin *scutum*. It signifies the shield whereon coats of arms are represented.

ESDRAELON (Greek for Hebrew *Jezreel*), PLAIN OF, a great plain extending across Central Palestine from the Mediterranean to the Jordan, in the form of a triangle. It is drained by the River Kishon, which flows westward to the Mediterranean. The plain of Esdraelon is remarkable for the richness of its vegetation, but it has few inhabitants, and its cultivation is entirely neglected. Among its subsidiary valleys are those of Engannin, Taanach, and Megiddo. This plain is celebrated for many important events in Old Testament history.

ESDRAS, BOOKS OF, two apocryphal books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second, and the apocryphal books the third and fourth books of Esdras. The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date, or to have been interpolated by Christian writers. It belongs to what are called the apocalyptic class of Jewish writings, of which the canonical types are the book of Daniel and the Revelation of St. John.

ESHER, a village in England, county Surrey, a station of the South-western Railway, 15 miles S.W. of London. Claremont Palace, where the Princess Charlotte resided and died, and a celebrated mansion, called Esher Place, once occupied by Cardinal Wolsey, are in the neighbourhood. Pop. of township, 1815.

ESK (that is, water). There are seven small rivers in Scotland of this name, viz. the Esk, the Black Esk, and the White Esk in Dumfriesshire; the North Esk and South Esk in Forfarshire; and the North Esk and South Esk in Edinburghshire. The eastern district of Dumfriesshire is called Eskdale.

ESKIMOS. See ESQUIMAUX.

ESKI-SAGRA, a town, Turkey in Europe, on the south slope of the Balkan, 70 miles N.W. of Adrianople. It has manufactures of carpets, coarse linen, and leather, and in its vicinity extensive gardens of roses, numerous orchards, and mineral springs. Pop. 20,000.

ESNEH, ESNE, or ASNA (Coptic, *Snê*), a city of Upper Egypt, in the Thebaid, on the left bank of the Nile, 28 miles S.S.W. of Thebes. Esneh stands on the site of the ancient Latopolis. Among the ruins there is a beautiful portico of twenty-four columns, which is one of the most perfect remains of Egyptian architecture. The ceiling contains a zodiac,

which has been supposed to be 2000 years older than that of Denderah; but Champollion, in one of his letters, dated 1829, is decidedly of the opinion that the *great temple of Esneh*, as it is called, instead of being one of the most ancient buildings of Egypt, is one of the most modern. He draws this conclusion from the rudeness and stiffness of the bass-reliefs and hieroglyphics as well as from the inscriptions. The latter contain merely the names of different Roman emperors. 'The real age of the *pronaos* of Esneh,' says M. Champollion, 'is therefore not of a more remote period than the reign of the Emperor Claudius; and the sculptures, among which is the famous zodiac, are as late as the time of Caracalla.' Other antiquarians have taken the same view. Esneh is the entrepôt of the Senaar caravans. It has a cotton-spinning mill, shawl manufactures, and potteries. The modern town is a poor place. Pop. 4000.

ESOP. See ÆSOP.

ESOTERIC (Greek, *esōterikos*, inner), a term used in opposition to *exoteric*. In reference to the teaching of Pythagoras, Aristotle, and other ancient philosophers it refers to those doctrines which they expounded to their select disciples in contradistinction to those which they published to all the world (exoteric). The distinction does not necessarily imply that the esoteric doctrines were kept secret as a mystery, but only that they were of a higher and more difficult order, requiring more preparation and preliminary study for their reception. See ARISTOTLE.

ESPAGNOLETTO. See SPAGNOLETTO.

ESPALIER (French; from Italian *spalliere*, a support for the shoulder). This term is used by the French to signify a row of trees planted along a wall, and fastened to it by a palisade or trellis, or even with nails. In English it is applied to an artificial framework of wood, iron, or other material used in place of a wall to train trees or shrubs upon; also to a row of trees so trained which may be planted so as to form a regular hedgerow.

ESPARTO (Greek, *spartos;* Latin, *spartum*), a plant growing native in Spain and Africa, known to the ancients and applied by them to the manufacture of cordage, matting, &c., and still more extensively used at the present day. This plant, called by botanists *Stipa* or *Macrochloa tenacissima*, is a species of grass, and is found chiefly in the southern provinces of Spain. It grows in tufts and bunches, like rushes, to a height of from 2 to 4 feet, and has a long, flat, lanceolated blade, which becomes cylindrical when the ripened plant begins to dry. It is pulled up by the roots, dried in the sun, and packed in bundles for exportation. Besides the various uses already indicated, esparto has recently been applied to the manufacture of paper, for which various patents have been taken out in this country. The paper made from esparto is said to have some points of superiority over that made from other materials. The fibres of esparto are specifically lighter than those of any other material used in this manufacture; it admits of minute subdivision without destroying the lighter or downy fibres, and has thus superior qualities for felting; this also enables it to take a finer surface than paper made from the ordinary material. A small quantity of esparto is exported from Algeria, but the principal supply comes from Spain, in some districts of which it is an extensive product. Of late years the political troubles of Spain have relaxed the industry of that country, and rendered its production very uncertain. Esparto has consequently been comparatively scarce and dear.

ESPINASSE, JULIE JEANNE ÉLÉONORE. See L'ESPINASSE.

ESPIRITO-SANTO, a province, Brazil, bounded north by Bahia, west by Minas-Geraes, south by Rio-de-Janeiro, and east by the Atlantic; length, about 260 miles; breadth, about 120 miles; area, 43,290 square miles. It is tolerably well peopled along the coast, but the interior, understood to be covered with lofty mountains and impervious forests, and almost entirely in the hands of wild Indians, is very imperfectly known. The chief rivers, the Benevente, Cabapuana, Carahipe, Doce, Guandu, &c., all flow east to the Atlantic in courses nearly parallel. The climate is generally healthy and the soil fertile, though little cultivated. Sugar, rum, cotton, dye-woods, &c., are exported, but not in large quantity. The estimates of population are very uncertain, varying from 65,000 to 100,000.

ESPLANADE, in fortification, a term formerly used for the glacis of the counterscarp, now more correctly designates the wide open space left between a citadel and the nearest houses of the city to prevent an enemy from being able to assail it under cover of these houses. The esplanade is commanded by the citadel.

ESPOUSALS, in Scotch law, a solemn engagement or contract between a man and woman to marry each other. By the law of Scotland all contracts relating to marriage may be resiled from unless a *copula* has followed, which completes the marriage, but the party is liable to damages *in solatium* of his or her injured feelings.

ESQUIMAUX, or ESKIMOS, the name commonly given to a race inhabiting all the coasts of North America, from Greenland to Behring's Straits, north of lat. 60°. It is not the native name, and is even said to be unknown to the Esquimaux, who call themselves *Inu-it*, the people. Various derivations have been given of the name; the received one is that which refers it to an Algonquin or Abenaki word signifying eaters of raw flesh. Sir John Richardson derives it from Canadian French, *Ceux qui miaux* (*miaulent*), those who mew, referring to the peculiar cry with which they salute vessels. The Esquimaux are considered by many ethnologists as of Mongolian origin; while others find in them strong resemblances to the Red Indians. They consist of three principal stocks —the Kalalits, better known by the name of Greenlanders; the Esquimaux proper, on the north and east coast of Labrador; and the Western Esquimaux, found along Hudson's Bay, the west side of Baffin's Bay, the polar shores of America as far as the mouths of the Coppermine and Mackenzie rivers, and both on the American and Asiatic sides of Behring's Straits. This last locality gives them the remarkable peculiarity of being the only aboriginal race common to the Old and the New World. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique, and yellow and brownish skin. The Greenlanders are less than 5 feet in height, broad-shouldered, with large heads, round, flat cheeks, small noses, high cheek-bones, small mouths, and long, straight, black hair. Their skin is distinguished by a brown colour; but it is doubtful if this is natural, as they use much oil and little water. The dress of the men consists chiefly of a cloak of seal-skins, which reaches to the knees; and that of the women differs from it only in a few minute points, often scarcely discernible. Reindeer and other furs are also used as material for dress, according to the season, as well as skins of otters, foxes, martins, seals, &c. The natives show great skill in adapting these materials. In summer they live in tents, covered with the skins of reindeer and fallow deer; in winter they may be said to burrow beneath the snow. In Greenland houses built of stone and

cemented with turf are used as permanent habitations. They are usually not more than 6 or 8 feet high. In Labrador the houses are usually sunk 3 feet in the ground. Vegetation being extremely stunted within the limits of their territories, their chief dependence for food is on fishing, particularly on fishing for the seal, which seems to be as essential to them as the reindeer to the Laplanders. The most valuable possessions of an Esquimaux are his boat and his sledge. Owing to the rigour of the climate they eat flesh and fish raw, and consume much fat and oil, which are considered delicacies. Their weapons are bows and arrows, and spears or lances, generally pointed with stones or bones, but sometimes also with copper. Their language consists of long, compound words, and has regular, though remarkable, inflections. In grammatical structure, at least, it is American. In intellect they are by no means deficient, and show a considerable aptitude for instruction; in manners they are kind and hospitable, love freedom, and manifest a deep attachment to their homes and native land. They are said by Richardson to be scrupulously honest in their dealings with one another, but totally regardless of the rights of strangers. Their religious ideas appear scanty, but the success which ultimately attended the labours of the Danish missionaries, after they had almost begun to despair of it, proves their capability of receiving Christianity, of understanding its truths, and conforming to its precepts. See ETHNOLOGY.

ESQUIRE (from the Latin *scutum*, a shield, through the old Fr. *escuyer*), anciently, the person that attended a knight in the time of war, and carried his shield. Originally it was a title of chivalry due to personal service, and not conferred by the holding of property. It is still legally regarded as a special prerogative of certain classes, but by popular estimation it first came to be conferred as a token of respect upon untitled holders of property. This popular use of the title was frequently accompanied with the name of the estate in virtue of which it was conferred. A., esquire of B., indicating the popular belief that the title was the rightful distinction of a holder of property. Like all other titles of mere courtesy, the popular use of the title esquire has become gradually more general until it is now little more than an equivalent for Mr. when used in epistolary correspondence. Those to whom the title of esquire is due in England are, all noblemen's younger sons, and the eldest sons of such younger sons; the eldest sons of knights, and their eldest sons; the heads of ancient families by right of prescription; esquires by creation or office, namely, judges, officers of state, justices of the peace (during office), barristers, doctors of the several faculties, and some other officers who hold the title by courtesy; esquires appointed by knights of the Bath, each of whom has three to attend him at his installation.

ESQUIROL, JEAN-ETIENNE DOMINIQUE, a French physician, born in Toulouse in 1772. After studying at Paris he returned to Toulouse and entered the hospital of La Grave, whence he was sent, at twenty-two years of age, as a sanatory officer to the army of the Pyrénées-Orientales. In 1805 he received the degree of M.D. from the University of Paris, and after visiting the lunatic asylums of France he was, in 1811, appointed physician to the Salpêtrière, where he distinguished himself as well by his clinical demonstrations as by the ameliorations he introduced in the condition of the insane. In 1823 he was made inspector-general of the faculty of medicine, and in 1834 correspondent of the Academy of Moral Sciences. He died 12th December, 1840. Among his works are, Des Passions considérées comme Causes, Symptômes et Moyens Curatifs de l'Aliénation mentale (1805); Des Établissements d'Aliénés en France (1819); Des Maladies mentales Considérées sous les Rapports médical, hygiénique et médico-légal (1838).

ESSAY, a composition in which something is attempted to be proved or illustrated. It is not easy to define the limits of the essay as a species of composition. In general it is understood of the briefer and less elaborate efforts of literary skill; but this distinction is not always maintained. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions: thus we have Locke's Essay on the Human Understanding. Still an essay, however elaborate in execution, is generally understood to mean a composition having a definite and specific object more limited in its range than a formal exposition of any art or science. The subject of an essay may be any topic of human interest; it may be philosophical, scientific, logical, ethical, æsthetical or humorous; and a series of essays may embrace connected, but so far independent views of the most extensive range of subjects. There is a class of English writers to whom the descriptive term *essayist* is applied. The Spectator, The Tatler, The Rambler, and many other extensive collections of brief treatises embracing every variety of subjects, are among the works of this class of writers, the best of whom, from the variety which their works present in other particulars, can only be distinguished by excellence of style. From the brevity of the essay, considered in its ordinary sense, and the necessity of giving it some specific claim on the attention of cultivated readers, style may possibly be considered to have been, at least until recently, the distinctive characteristic of essay writers, and this form of composition may be supposed to have done some service in maintaining the standard of purity and excellence of our language. In recent times circumstances have somewhat changed. The vastly extended range of modern inquiry has opened up innumerable subjects for brief and tentative compositions, in which the matter is of infinitely more importance than the style; and the vast number of our serial publications subjects to so incessant a drain the powers of our popular writers, that whether in matters of science or taste, mere style can hardly be said to receive as much attention now as formerly.

ESSAYING. See ASSAYING.

ESSEK. See ESZEK.

ESSEN, a town of Germany, in the Prussian province of Rheinland, on the Berne, 18 miles north-east of Düsseldorf. It has two Protestant and two Roman Catholic churches, a synagogue, monastery, gymnasium, two hospitals, manufactures of woollen and linen cloth, iron and steel ware, leather, and vitriol, a trade in colonial produce, drugs, wool, and wine. Essen is celebrated for the steel and iron works of Krupp, which, with the exception of those of Creuzot, are unparalleled in extent in Europe. The number of men employed is about the same as in the great French work, near 10,000. This great manufactory was established in 1827 by Mr. Krupp, senior, with only two workmen. It rapidly became flourishing under the management of his son, who, by dint of long study, succeeded in casting steel in larger blocks than had hitherto been considered practicable. At the London Exhibition of 1851 he produced a block of over 44 cwts. At that time a ton was considered an extraordinary size. This opened up new applications of cast-steel, of which Krupp himself made prompt use, as was shown in the exhibitions of Munich (1854), Paris (1855), and London (1862). There is now hardly any practical limit to the size of the blocks that can be cast by the Krupp method. The establishment has in the mean-

time been growing to colossal proportions. The works cover 156 acres, and extend over a district of about 9½ square miles in extent; a railway of 10 miles length unites various parts of them, on which 6 locomotives and 150 waggons are employed. There are in the establishment 160 steam-engines, with 6000 horse-power (a single one having 1000 horse-power); 400 smelting, welding, and annealing furnaces; 110 forges, &c. There are 40 steam-hammers, one weighing about 50 tons. The block of the anvil consists of a mass of cast-steel of 150 tons weight. The daily consumption of coal and coke is about 50,000 bushels. All the processes of iron and steel manufacture are carried on here. The manufactory is specially famous for its rifled steel cannon. The workmen at the Essen works subscribe from ½ to 1 silver groschen per thaler of their pay to the hospital fund, and the whole subscriptions are doubled by the Messrs. Krupp. When a workman meets with an accident in the works he receives his full pay till his recovery. After twenty-five years' service the workmen receive a pension. Pop. in 1871, 51,526.

ESSENES, or ESSÆANS, a sect among the Jews, the origin of which is unknown, as well as the etymology of their name. It appears to have sprung up in the course of the century preceding the Christian era, and disappeared on the dispersion of the Jews after the siege of Jerusalem. The sect appears to have been an outcome of Jewish mysticism and asceticism, which gradually assumed the form of a distinct organization. The society seems to have consisted of four orders, and to have had various initiatory rites and ordeals. They had a strict rule of life, analogous to that of a monastic order. They were unusually strict in observing the Sabbath and the law of Moses, and though they did not themselves offer sacrifices, they sent presents to the temple at Jerusalem. There is very little information about them in the Talmudical writings of the Jews, and the chief authorities regarding them are Josephus and Philo. The Essenes had a longer vitality in Egypt than elsewhere. Here they seem to have merged in the sect of mystics called *Therapeutæ*. The origin of monasticism in the Christian church has been traced to these two sects.

ESSENTIAL OILS. See OILS (ESSENTIAL).

ESSEQUIBO, a river of British Guiana, which flows into the Atlantic; lon. 58° 30′ W.; lat. 7° N. It is 20 miles wide at its mouth, but difficult of navigation on account of the sand-banks which run in different directions across its entrance. It contains a number of islands. The influence of the tide is felt about 100 miles up the river.

ESSEQUIBO, a settlement of British Guiana, on the borders of the above river, originally belonging to the Dutch, but after having several times changed possessors was finally ceded to Great Britain in 1814. The settlement is flourishing, the country well cultivated and extremely fertile, producing coffee, cotton, cocoa, and sugar.

ESSEX, a maritime county in England, E. coast, bounded N. by Suffolk, S. by the Thames, W. by Hertford and Middlesex, and E. by the German Ocean; 60 miles in length, S.W. to N.E.; greatest breadth, about 45 miles. Area, 1,055,133 acres. The surface, though generally level, is not wholly so, being in many parts diversified by gentle hills and dales, especially towards the north-west, where there is a continued inequality of surface. The most level tracts are those of the south and east hundreds, where there are extensive marshes, that give rise to fever and ague; but the middle and north districts are remarkably healthy. Agriculture is in a forward state here, the farmers of Essex being reckoned amongst the best in the kingdom. The soil is in general extremely fertile, and particularly well adapted for the growth of corn, as the superiority of the Essex wheat sufficiently proves. Beans and pease also thrive uncommonly well, perhaps better than in any other land in England. The other principal productions are potatoes, barley, oats, mangolds, turnips, tares, rape, mustard, and trefoil. Hops are also raised to a considerable extent, and their cultivation is on the increase. The raising of caraway, coriander, and teazel, is peculiar to this county. There is no particular breed of cattle here. Grazing is chiefly confined to the marsh lands. The suckling of calves, for which Essex is celebrated, is carried on to a great extent. They are fattened for about three months, when they are slaughtered for the London markets. The total acreage under crops of all kinds in 1872 was 813,902, of which 602,043 were under corn and other rotation crops, and 173,886 under permanent pasture. The total number of cattle in 1872 was 71,089; of sheep, 340,894; agricultural horses, 38,489; pigs, 113,104. The principal dairy farms are in the parish of Epping and vicinity, and have been long famous for the excellence of their cream and butter. The size of farms varies greatly, but averages from 150 to 200 acres. Fish are plentiful on the coast and in its various creeks. Near Colchester, and about the Mersey Island, are some valuable oyster-beds, the oysters from which are exported in considerable quantities. The manufactures of the county are not very extensive, with the exception, perhaps, of the silk-mills at Colchester and several other towns. Many of the industrious poor are employed in making straw plait for the London market. The principal rivers in the county are the Roding, Crouch, Chelmer, Blackwater, Colne, &c. It has also the Thames, Lea, and Stour, as boundary rivers—the first on the S., the second on the W., and the third on the N.; and it is traversed S.W. to N.E. by the Eastern Counties Railway. The chief towns are Chelmsford, the capital; Colchester, Maldon, and Harwich. The county is divided for the purpose of parliamentary representation into East, South, and West Essex, each returning two members; the borough of Colchester returns two; Harwich and Maldon one each. Pop. in 1861, 404,851; in 1871, 466,436.

ESSEX, EARL OF. See CROMWELL (THOMAS).

ESSEX, KINGDOM OF. See ENGLAND.

ESSEX, ROBERT DEVEREUX, SECOND EARL OF, the son of the first earl, was born at Netherwood, Herefordshire, in 1567. He was educated at Trinity College, Cambridge, and appeared at court in 1584, and was soon after made Master of the Horse and Knight of the Garter. He served as captain-general of the cavalry under Leicester in the Netherlands in 1587. On Leicester's death in the following year he became the chief favourite of Elizabeth. In 1589 he joined without leave from the queen the expedition of Drake and Norris to Portugal, in which he served as a volunteer. In 1590 he married the widow of Sir Philip Sydney, a daughter of Walsingham. In 1591 he was sent to support Henry IV. against Spain, but the expedition effected nothing of importance. In 1596 he commanded an expedition to Spain and burned Cadiz. In 1597, after an unsuccessful expedition to the Azores, he, with Howard and Raleigh, made extensive captures of Spanish ships. On his return from this expedition, though at first ill-received by the queen, he was made hereditary earl-marshal. Next year he quarrelled with the queen, who bade him 'go and be hanged.' After some months a reconciliation took place, and he was appointed Lord-lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been

entirely unsuccessful in his government. He was made a prisoner in his own house, deprived of his offices, and his monopoly for sweet wines. He now conceived a deep resentment against the queen's councillors, particularly Cecil and Raleigh, who, he imagined, had biased her against him. He threw open his house to the discontented of all parties, and courted both the Puritans and the Roman Catholics. Being summoned before the council he assembled his friends in his house, arrested the messengers sent to him by the queen, and proceeding to the city endeavoured to enlist the citizens in his favour. After a skirmish with a party of soldiers he returned to his house, but after a short defence he was compelled to surrender, and sent to the Tower. He was tried for treason on 19th February, and executed on the 26th February, 1601. Essex was possessed of some good qualities, according to his panegyrists; but they seem to have been but weak ones, as the vanity and presumption excited by the queen's partiality sufficed completely to overbear them.

ESSLINGEN, a town of Germany, in Würtemberg, beautifully situated on the Neckar and the railway to Ulm, 7 miles E.S.E. of Stuttgart. It is of Roman origin, was long an imperial free town, is surrounded by walls flanked with towers, and defended by a castle, and has two churches, one of them an ancient but handsome Gothic structure, with a tower 230 feet high, an ancient and a modern townhouse, an old monastery, hospital, and theatre, manufactures of various articles of wood, gold, silver, and tin, cutlery, philosophical instruments, dyeworks, paper, spinning, and other mills; a trade in the above articles, and in wine, wood, vegetables, and fish. Pop. in 1871, 17,941.

ES-SOUAN, or ASSOUAN (Syene), a town of Upper Egypt, on the east bank of the Nile, 110 miles S. of Thebes. It has a trade in dates, senna, charcoal, &c., and in Abyssinian slaves. There are granite quarries in the neighbourhood. The ruins of a wall and a mosque are the principal remains of the ancient city.

ESTAFETTE, a courier who carries his message in conjunction with others by relay.

ESTAMINET (French). The saloon of a café where smoking is permitted. The origin of this word is uncertain. It is supposed to come from *estamina*, a kind of cloth with which the tables of such saloons were formerly covered.

ESTATE, in law, signifies the title or interest which a person has in lands, tenements, hereditaments, or other effects, the word being derived from the Latin *status*, which means the condition or circumstances in which a person stands in regard to his property. Estate is real or personal. The phrase *personal estate* is applicable not only to movables, goods, money, bonds, notes, but also to some fixtures temporarily attached to lands or buildings; and the distinction between those fixtures which are temporarily such, and those which belong to, and form a part of the house or other real estate, is of importance, as this distinction will determine how it is to be attached on mesne process, or seized and sold, or set off on an execution, and also how it descends on the decease of the proprietor. But personal estate also applies to some interests in lands or houses; thus a lease of them for a certain number of years, though it be more than a hundred, and so longer than any person is likely to live, is personal estate; and yet an estate for the life of the owner, or of any other person, in these subjects, though the person by whose life the interest is limited may be ever so old or infirm, and likely to survive ever so short a time, is real estate, and is subject to the law regulating such estate, in regard to sales and descents. Real estate in lands is of various kinds and descriptions, according to the quantity of interest, its duration, or the time by which it is limited in respect to its commencement or termination, and the number and condition of the owners. A *fee simple* is the amplest estate which the law admits of. (See FEE.) A *freehold* is an estate for the life of any person or persons in lands or tenements. An estate in tail is one limited to certain heirs. (See ENTAIL.) An estate in *remainder* is one of which the owner is to come into possession after the expiration of an intermediate estate of another person, or number of persons or heirs; and so also is an estate in reversion: thus, if one grants an estate tail, this estate tail may expire, in which case the lands will come back or revert to the grantor, and his estate, which still remains to him after he has granted the estate tail, is therefore called a *reversion*. As to the number of owners, an estate *in common* is a freehold belonging to more than one proprietor, in undivided shares; and so also is an estate in *joint-tenancy*, but there is this distinction between these two kinds of estates, that when one joint-tenant dies, his share goes to the other joint-tenants, which is not the case in tenancies in common. An estate in *coparcenary* arises when an estate in fee simple descends, on the decease of the owner, to his daughters, sisters, aunts, or female cousins, or their representatives, being females; and they are called *coparceners*, or, for brevity, *parceners*. Real estate left to any one by will is called a *devise*, or an estate *by devise*, in distinction from a bequest of personal property, which is called a *legacy*.

ESTATES OF THE REALM, THE, are the lords spiritual, the lords temporal, and the commons. From the circumstance that in this country the lords spiritual and temporal meet in one house, and practically form one branch of the legislature, the popular error has arisen that the king forms one of the three estates of the realm. It appears, however, from our ancient records that the three estates with us, as with the continental kingdoms, are those stated above. See Hallam's Middle Ages, vol. iii. ch. 8, part 3.

ESTE (ancient *Ateste*), a town, Italy, Venetia, beautifully situated on the south side of the Euganean Hills, 16 miles S.W. of Padua. It is an ancient place, with an unaltered Lombard aspect; and has a castle, the cradle of the Este family, one of the oldest and most illustrious in Europe; a Romanesque duomo with a hanging tower. Manufactures of silk goods, hats, saltpetre, earthenware, and majolica; numerous silk-mills and whetstone quarries. Pop. 10,640.

ESTE, one of the most ancient and illustrious families of Italy.—OBERTO I., a descendent of Adelbert II., marquis of Tuscany, who had some fiefs in Tuscany and Tunigiana, took the title of Marquis of Este. He attached himself to the fortunes of Berenger II., king of Italy (951), but afterwards (968) passed over to Otto I., who made him Count of the Palace. He died about 972, and was succeeded by his son, OBERTO II. He supported Hardouin, king of Lombardy, against Henry II., by whom he was taken prisoner and deprived of his fiefs in 1014, but restored the same year. He died in 1015, and was succeeded by his son ALBERT AZZO, who, together with his brother, had been put to the ban of the empire and imprisoned (1014) for supporting Hardouin, but they soon recovered their liberty. He opposed the election of Conrad II. (1025), but finding little support in Italy, retired to Aquitaine. He died about 1029, and was succeeded by his son, ALBERT AZZO II., who is considered the founder of the greatness of his house. He inherited or acquired Este, Rovigo, Montagnana, Casal Maggiore, and other places in Italy; and was made governor of Milan by Henry III. in 1045. He married, first Cunegonda, sister of Welf (or Guelf)

III. of Carinthia, and afterwards, as his second wife, Garisenda, countess of Maine, of which county he took possession, and gave it to his son Ugo, who soon after lost it. Another of his sons became Duke of Bavaria in 1071, by the title of Welf I. He was the ancestor of the German branch of the house of Este, the Dukes of Brunswick and Hanover. (See BRUNSWICK, FAMILY OF.) Albert Azzo died at an advanced age in 1097, having previously resigned his Italian possessions to his son Fulk, and retired to Burgundy. —FULK I. was attacked by his brother Welf, who compelled him to become tributary to him to the extent of a third of his revenues. He was succeeded in 1137 by his son, OBIZZO I., who joined the Lombard league against Frederick Barbarossa in 1167. He was chosen podestà of Padua in 1182, and made Marquis of Milan and Genoa, a dignity which was equivalent to a vicariate of the emperor, in 1184. He died in 1193, and was succeeded by his son, who in the annals of the family is called Azzo V. Either he or Oberto acquired by marriage Ferrara, with its dependencies in Romagna, and with a feud which became hereditary with the house of Torello, for a member of which house the bride, violently carried away by the Estes, was intended. The house of Este thus became vassals of the church as well as of the empire. He was succeeded by Azzo VI., who died in 1212. He was constantly engaged in war with the Torelli, by whom he was thrice driven from Ferrara. ALDOBRANDINO, his son, died young, and was succeeded by his brother Azzo VII., a minor, in 1215. He was engaged in protracted wars with the Ghibelline party, particularly with the houses Torello and Romano, in which he was finally victorious. Honorius VII. invested him with the marquisate of Ancona. He died in 1264, and was succeeded by his grandson, OBIZZO II., who was chosen Lord of Modena and Reggio. We may pass over his successors on to NICCOLO III., who succeeded in 1393 at the age of nine. During his reign, and those of some of his predecessors, the house of Este became patrons of literature. He caused his second wife, Parisina Malatenta, and his natural son to be executed for an unnatural intercourse, together with two ladies of the court who were their accomplices. This is the subject of Byron's poem Parisina. He died at Milan, 26th December, 1441. — LIONEL, his son (1441–50), receives a high character from Muratori for justice and piety, and for his patronage of letters. He mediated a peace in 1450 between the Venetians and Alfonso, king of Sicily; and died in November of the same year. He was succeeded by his brother, BORSO, who died 20th August, 1471, who received new accessions of dignity from the emperor, and was created Duke of Ferrara by Pope Paul II. in April, 1471. His reign was peaceable and prosperous. He established printing in his estates.—ERCOLE I., his brother (died 25th January, 1505), succeeded, to the prejudice of his son Niccolo. His usurpation caused a war, which was unsuccessful in deposing him. He had Milan and Florence for allies, the pope and Venice for adversaries. After the conclusion of peace in 1484 he maintained neutrality in his estates for the remainder of his reign, while the rest of Italy was convulsed with wars and revolutions. He had for his minister Boiardo, the famous author of the Orlando Innamorato; and Ariosto, born near the commencement of his reign, grew up under his patronage.—ALFONSO I., his son, died 31st October, 1534. His reign was a contrast to the peaceable one of his father. In 1509 he joined the league of Cambray, and commanded the Papal army as gonfalonier. While he was conducting the operations of the allies elsewhere, his estates were ravaged by the mercenary troops of Venice, whose atrocities are described in the thirty-sixth canto of the Orlando Furioso. Alfonso continued in the French alliance after the pope had joined the Venetians. He assisted in the battle of Ravenna, and took prisoner Fabrizio Colonna, the general of the pope. (See COLONNA.) After the French had been driven from Italy he endeavoured to make peace with the pope; but Julius continued implacable. Leo X. restored him to his possessions, with the exception of Modena and Reggio, but afterwards excommunicated him. He joined in the wars between Francis I. and Charles V. on the side of the French king, but was afterwards reconciled with the emperor, who confirmed him in his possessions, against Pope Clement VII. (1530). He married as his second wife the famous Lucrezia Borgia, of whom he had the honour to be the fourth husband. His brother, the Cardinal Ippolito, was the patron of Ariosto. Alfonso was succeeded by his son by Lucrezia, ERCOLE II., who died 3d October, 1559. He married Renée of France (daughter of Louis XII.) in 1528. She favoured the Reformation, and made the court of Ferrara the resort of the few advocates of that cause in Italy. Calvin visited it in 1535. Ercole at first adhered to the imperial party, but in 1556 he joined the league of Paul IV. and Henry II. of France against Spain, and was made general of the allied forces; but he did not push the war with vigour, and made peace with Spain in 1558. Leonora, his daughter by Renée, was the object of the unfortunate attachment of Tasso. He was succeeded by his son, ALFONSO II., the patron and persecutor of Tasso, who died 27th October, 1597. Tasso was imprisoned by him in a madhouse for seven years (1579-86), for daring to set his eyes on the Princess Lucrezia, and was liberated at length at the intercession of the pope and the emperor. Although three times married, Alfonso left no heir. He was succeeded by his cousin CESARE (died 11th December, 1628), whom by his testament he had made his heir; but this disposition was annulled by the pope, Clement VIII., who excommunicated Cesare and deprived him of Ferrara, with the dependencies of the Church. Cesare was obliged to content himself with Modena and Reggio, which depended on the empire. From this period the political importance of the house of Este greatly diminishes, and we need not enumerate all the different princes. The last sovereign of the house was FRANCESCO V., who succeeded in 1846. He withdrew 23d March, 1848, in consequence of one of the numerous insurrections stimulated by the French revolution of February. He was re-established, but fresh disturbances broke out in 1859, the dynasty was deposed by the National Assembly, the duchy was annexed to Sardinia by the Treaty of Zurich, 10th November, 1859, and has consequently been incorporated with the Kingdom of Italy.

ESTELLA (ancient *Alba*), a town, Spain, Navarre, on the left bank of the Ega, here crossed by two fine bridges, 24 miles south-west of Pampeluna. It consists of several squares, and clean well-paved streets, and has six churches, one of them a magnificent structure with a lofty tower; an ancient castle, a town-house, college, and an hospital; manufactures of woollen and linen goods, leather, and earthenware, several distilleries and oil-mills, some trade, and an annual fair. Don Carlos, who long made it his headquarters, was proclaimed king at Estella in 1833. Pop. 5750.

ESTEPA (ancient *Astapa*), a town, Spain, Andalusia, on the north side of Mount San Francisco, 50 miles east by south of Seville. It consists chiefly of three main streets and four squares, and has two churches, one of them a handsome structure, formerly used as a mosque; a college, several suppressed convents, two hospitals, and the remains of an old castle,

once deemed impregnable. The manufactures consist of coarse cloth and baize; the trade is in grain, fruit, brandy, oil, wool, and cattle, and both building stone and marble are quarried in the vicinity. Pop. 7339.

ESTEPONA, a seaport, Spain, Andalusia, on the Mediterranean, 23 miles north-east of Gibraltar. It consists of seven small squares, and wide, well-paved, and regularly-built streets; and has a large and handsome parish church, with a tower; a college, a custom-house, and an ancient castle; manufactures of woollen stuffs, leather, and pottery, and a limited trade in grain, cattle, fruit, and lead—the last obtained from mines in the vicinity. Pop. 8475.

ESTERHAZ, a village, Hungary, county and 14 miles E.S.E. of Oedenburg, on the south shore of Lake Neusiedel. It contains the original seat of the Esterhazy family, a huge structure in the most florid Italian style, long ago deserted for that of Eisenstadt, but still presenting marble halls brilliant with gold and paintings.

ESTERHAZY VON GALANTHA, a family of Hungarian magnates, afterwards princes of the German Empire, whose authentic genealogy goes back to the first half of the 13th century. They were zealous partisans of the house of Hapsburg, to whom, during the reigns of Frederick II. and Leopold I., they lent a powerful support. In 1238 Peter and Elias, sons of Salomon von Estoras, divided their father's inheritance. The former obtained Zerhaz, the latter Illyeshaza, and thus became the founders of two principal lines, the latter of which became extinct in the male line in 1838, with Count Stephen Illeshazy. Peter's descendants took from their domain the name of Zerhasy, till Francis Zerhazy, who was born in 1563, and died in 1595, and was vice-regent of the county of Presburg, changed this name into Esterhazy in 1584, on the occasion of his being named Lord of Galantha. Francis left four sons—Gabriel, Daniel, Paul III., and Nikolaus II. Gabriel's male descendants became extinct with his son Wolfgang in 1670, whereas the other three founded separate houses—at Czeesznek, in the county of Veszprim; at Altsohl, in that of Sohl; and at Frakno or Forchenstein, in that of Oedenburg. The two first lines obtained the title of count in 1683; the last was raised to the title of Margrave of Forchenstein in 1626, in the person of its founder, Nikolaus II., who was one of the most distinguished members of the family; and at his death, in 1645, was palatine and field-marshal.

ESTHER, a Jewess, whose story is told in the book of Esther. Ahasuerus, king of Persia, had dismissed his queen Vashti for disobedience. By the advice of his ministers he collected together a number of virgins as concubines, with a view to selecting one of them as the successor of Vashti. Esther was among these. She was an orphan brought up by her cousin Mordecai, who charged her to conceal her race. Her beauty enchanted Ahasuerus, and she was chosen queen. After this Ahasuerus promoted Haman, the son of Hammedatha, an Agagite, to the highest honours in the state. Mordecai, who seems to have held a subordinate position about the palace, refused to give this man the customary honours of his rank, apparently because he was of a race held accursed by the Jews. Haman's wrath at Mordecai's contempt led him to plan the destruction of all the Jews, and he obtained the consent of Ahasuerus to a general massacre of them throughout the empire on the 13th day of the 12th month—a day appointed by lot. Esther, at the command of Mordecai, now appeared before the king uncalled, and at the risk of her life, to reveal her origin and ask the life of her people. The king, incensed against Haman now that he had discovered the queen to be a Jewess, commanded him to be hanged on a gallows he had prepared for Mordecai. But the decree granted to Haman could not be reversed, it being contrary to the law of the Persians to reverse any decree sealed with the king's seal. The seal was therefore committed to Mordecai, who was advanced to Haman's place, and who, together with Esther, wrote fresh instructions to all the provinces of the empire, permitting the Jews to stand up in their own defence. The fear of Mordecai caused the local governors to assist the Jews, and instead of the massacre of the Jews, it was a slaughter of their enemies that took place. The Jews celebrate this event on the 14th and 15th days of the month Adar, called the days of Purim, or the lot. Various opinions are held as to which king of Persia is to be understood by Ahasuerus. Darius and Xerxes are most commonly named. Niebuhr absolutely disbelieves the story of Esther.

ESTHETICS. See ÆSTHETICS.

ESTHONIA, ESTHLAND, or REVEL, a maritime government of Russia, bounded N. by the Gulf of Finland, E. by St. Petersburg, S.E. by Lake Peipus, S. by Livonia, and W. by the Baltic. Besides the mainland thus bounded, it includes several islands, of which the most important are Dagoe and Oesel; area, about 7610 square miles. It is of an irregularly oval shape, having its greater axis east to west, and has for the most part a flat or undulating surface. A few low heights occasionally appear, but scarcely deserve the name of hills. The whole of the north side, however, rises considerably above the sea, and presents to it ranges of cliffs, on which the waves often break with considerable violence. The air is somewhat moist, but the sky, notwithstanding, is generally clear, and the climate healthy. Winter lasts long, and wind, with more or less violence, is almost incessant throughout the year. The Narva, which merely bounds the government on the east, is the only river of any importance; but minor streams, as well as small lakes, are very numerous. The soil is by no means fertile. A great part of it, particularly in the north, is sandy, and in other quarters it is often covered with boulders and gravel; but fertile tracts of clayey or chalky loam occur, and the grain raised is said to equal the consumption. The crops include a little wheat, much barley and oats, and some flax, hops, and tobacco. Very little fruit is grown. Wood, however—chiefly pine, birch, and alder—is abundant; and the forests are well supplied with game. Fish abound, both in the lakes and on the coast, and active fisheries are carried on. The minerals are of no importance; and the manufactures, confined to coarse articles of primary necessity, are almost entirely domestic. The only exception is spirits, which are made in numerous distilleries, and partly exported. The only other exports of any importance are hides and salt fish. The chief imports are herrings and salt. The peasantry are almost all of Finnish origin, and speak a Finnish dialect, the vocabulary of which is described as scanty. The land is farmed chiefly by Germans and Danes. The prevailing religion is Lutheran; but education is miserably neglected. For administrative purposes Esthonia is under the Governor-general of Riga, and consists of four districts—Revel, the capital; Hapsal, Weissenstein, and Wesenberg. Pop. 322,668.

ESTOPPEL (Latin, *obstipare*) is anything which puts a period to an action by closing the ground of controversy. Thus a person's own deed, when adduced in evidence against him, is adjudged to be conclusive. In general any previous admission precludes the person who makes it from controverting the thing admitted; thus a tenant cannot dispute the title of the landlord of whom he holds.

ESTRAYS are any valuable beasts, not wild, found within a lordship, and whose owner is not known, such as are commonly impounded and not claimed. They are then to be proclaimed in the church and two nearest market-towns, on two market days, and not being claimed by the owner, belong to the king, and now commonly, by grant of the crown, to the lord of the manor or the liberty.

ESTRÉES, GABRIELLE D', Duchess of Beaufort, the mistress of Henry IV. of France, was the daughter of Antoine d'Estrées, a descendant of one of the noblest houses in Picardy, and born about 1571. Gabrielle was in her twentieth year of age when Henry first saw her in a visit to Cœuvres Castle; and she shortly after became his mistress. Henry married her to a nobleman named Damerval, of Liancourt; but subsequently dissolved the marriage. Henry intended to raise Gabrielle, whom he had created Duchess of Beaufort, to the throne as his lawful wife. This design was strongly opposed by Sully, and Gabrielle became his bitter enemy. But in 1599, while negotiations were in train for the divorce of the king, Gabrielle, having gone to Paris during Easter, was seized with convulsions after eating an orange, and died suddenly. It was suspected that she had been poisoned. She had three children to Henry, the most celebrated of whom was César, duke of Vendôme.

ESTREMADURA, a west division of Spain, consisting of the provinces of Badajoz and Caceres. It is bounded N. by Leon and Old Castile; E. by New Castile; E. and S. by Andalusia; W. by Portugal, and is generally surrounded by mountain-barriers. The north and south parts are mountainous; and another lofty range, a continuation of the mountains of Toledo, in New Castile, intersects it in the centre from east to west, and joins the Sierra del Portalegre, on the frontiers of Portugal. The portion of the province north of this range is called Estremadura Alta (Upper), that south of it Estremadura Baja (Lower). Estremadura consists chiefly of extensive plains, capable, from their fertility, of yielding corn, wine, and oil, in the greatest abundance, but which are left neglected and uncultivated, the result of a wretched government. The climate is hot in summer, but not ungenial; nor is the winter severe. The Tagus and Guadiana intersect it east to west, the former passing through Alta, and the latter through Baja Estremadura, and thus dividing it into three nearly equal parts. It is well watered by the numerous affluents of these two important streams. Game of every sort is plentiful, and immense flocks of sheep graze on the rich plains of this neglected country. They are of the Merino breed, the greater part of them being driven down annually from the highlands of the neighbouring and more mountainous provinces, by their owners, without leave asked or obtained, to quarter for the winter season on the warm, fertile lowlands of Estremadura. The minerals, of which there are copper, lead, iron, and silver, are entirely neglected; and there are no manufactures. The roads are miserable, being chiefly made by sheep, and the inns are of the most wretched description. Pop. 733,749.

ESTREMADURA, a maritime province of Portugal, bounded N. and E. by the province of Beira, E. and S. by Alemtejo, and W. by the Atlantic Ocean. It is divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous, and includes the last slopes of the Serra da Estrella, from which the Serra Alvayazere proceeds S.W., culminating in Mount Junto, 2320 feet; forming the heights of Torres Vedras, and ending on the north bank, and near the mouth of the Tagus. West of this ridge the country is mostly flat and sandy, especially towards the coast; and south-east of it, especially in the northern parts, it is more fertile. Wines (including those of Setubal, Bucellas, and Carcavellos) and olives are the principal produce; but wheat, barley, maize, hemp, legumes, and fruits of all kinds, including chestnuts, oranges, and lemons, are grown; and from the forests sumach and cork are obtained. Cattle-rearing is little attended to, but swine are numerous. Minerals abound, but only salt is wrought. There are some woollen and linen manufactures, and some crystal is made at Leiria. The climate is generally healthy. The principal city is Lisbon, the metropolis of Portugal, in which, and in Setubal, the most of the trade is concentrated. The province is divided into 136 concelhos. Area, 8834 square miles. Pop. 837,451.

ESTREMEZ, or ESTREMOZ, a town of Portugal, in the province of Alemtejo, 22 miles west from Elvas. It consists of an upper and a lower town, both indifferently built, and was once a place of great strength, though its fortifications are now falling to decay. It has several churches and convents, manufactures of hardware, potteries, tanneries, marble quarries, and an annual fair, which lasts five days. Pop. 7274.

ESZEK, or ESSEG, a royal free town of the Austrian Empire, Slavonia, capital of the county of Virovitica, in a marshy and unhealthy district, on the right bank of the Drave, here crossed by a bridge, 63 miles W.N.W. of Peterwardein. It consists of the town proper, partially fortified, and three suburbs, is the seat of an appeal court for three counties, and has a handsome square, several churches, a town-house, court-house, gymnasium, and normal school, two convents, an hospital, and barracks. The manufactures are trifling; but the four annual fairs, chiefly for corn, cattle, and hides, are important. As a Roman colony, founded by the Emperor Adrian, under the name of Mursia, it became the capital of Lower Pannonia, and in 335 was made a bishop's see by Constantine. Pop. 1869, 17,247.

ÉTAMPES (ancient *Stampæ*), a town of France, in the department of the Seine-et-Oise, in a beautiful valley, at the confluence of the Étampes and Juine, 30 miles S. by W. from Paris, and crossed by the Paris and Orleans Railway. It is a clean, well-built place, with planted boulevards, four Gothic churches, one of them a remarkable structure of the thirteenth century; a town-house of quaint architecture, a communal college, and the remains of an ancient castle, several tanneries and woollen bleacheries, and a considerable trade in corn, flour, and prepared wool. Pop. 8228.

ÉTAT-MAJOR, a term which has been in use in France from the time of Louis XIV., signifies the whole of the persons directing an army, corps, brigade, or regiment. The état-major of the land forces, by the law of the late empire, consisted of the marshals and generals of all arms. They were divided into active and reserved; the latter on three-fifths pay, and disposable in case of war. The état-major of an army in the field corresponds generally with what is called the staff of the general, consisting of a chief of the staff, aides-de-camp, intendants, surgeons, &c.

ETAWEH, or ETAWAH, a town, Hindustan, in the province and 70 miles S.E. of Agra, capital of the district of same name, on a series of heights intersected by deep ravines, above the lower bank of the Jamna. It was once a place of importance, and the residence of many of the Mogul grandees, but is now, with the exception of a splendid ghaut, a mass of dilapidated buildings, and ruins remarkable for the dreariness of their aspect. Pop. about 18,000.

ETCHING. See ENGRAVING.

ETEOCLES AND POLYNICES, two heroes of ancient Greek legend, sons of Œdipus, king of Thebes,

and Jocasta. After their father's banishment from Thebes, they agreed to rule the city each a year alternately. Eteocles violated this compact, and Polynices fled to implore the assistance of Adrastus, king of Argos, who marched against Thebes, with Polynices and six other Grecian princes. The city made an obstinate defence. The two brothers fell by each other's hand; and Creon, their uncle, ascended the throne of Thebes. He prohibited the interment of Polynices, under penalty of death; but Antigone, sister of the deceased, yielding to the voice of nature, resolved to perform this last rite for her deceased brother. She was discovered, and buried alive by the order of Creon. This act of cruelty recoiled on himself; for his son, Hæmon, who was in love with her, killed himself on her grave. Different versions of the story are given by the Greek dramatists (see THEBES). Racine has also dramatized this story with some poetical variations in his Frères Ennemis.

ETHELBERT, King of Kent, succeeded his father, Hermenric, about 560, and soon reduced all the states, except Northumberland, to the condition of his dependents. In his reign Christianity was first introduced into England. Ethelbert married Bertha, the daughter of Caribert, king of Paris, and a Christian princess, who, stipulating for the free exercise of her religion, brought over with her a French bishop. Her conduct was so exemplary as to prepossess the king and his court in favour of the Christian religion. In consequence, Pope Gregory the Great sent a mission of forty monks, headed by Augustine, to preach the gospel in the island (597). They were well received, and numbers were converted; and the king himself at length submitted to be baptized. Civilization and knowledge followed Christianity, and Ethelbert, about 600, enacted a body of laws, which was the first written code promulgated by the northern conquerors. Ethelbert founded the see of Rochester in 604. He died in 616, and was succeeded by his son Edbald.

ETHELBERT, King of England, son of Ethelwulf, succeeded to the government of the eastern side of the kingdom in 857, and in 860, on the death of his brother Ethelbald, became sole king. His reign was much disturbed by the inroads of the Danes, whom he repulsed with vigour, but without success, as, whenever they were driven from one part of the country, they ravaged another. He died in 866.

ETHELRED I., King of England, son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole kingdom. Assisted by his brother Alfred, Ethelred drove them from the centre of Mercia, where they had penetrated; but, the Mercians refusing to act with him, he was obliged to trust to the West Saxons alone, his hereditary subjects. Notwithstanding various successes, the invaders continually increased in numbers. Ethelred died, in consequence of a wound received in an action with them, in 871.

ETHELRED II., King of England, son of Edgar, born 968, succeeded his brother, Edward the Martyr, in 978, and, for his want of vigour and capacity, was surnamed *the Unready*. About 981 the Danes, who had for some time ceased their inroads, renewed them with great fury. In his reign began the practice of buying them off by presents of money. After repeated payments of tribute (see DANEGELT) he effected, in 1002, a massacre of all the Danes in England. Such revenge only rendered his enemies more violent; and, in 1003 Sweyn and his Danes carried fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as King of England; while Ethelred, in 1013, fled to Normandy with his family. On the death of Sweyn he was invited to resume the government. He died at London in 1016.

ETHELWULF, King of England, succeeded his father, Egbert, about 837, and soon after his accession associated his son Athelstan with him, giving him the sovereignty over Essex, Kent, and Sussex. In 851 the Danes poured into the country in such numbers that they threatened to subdue it; and though opposed with great vigour by Athelstan and others, they fixed their winter quarters in England, and next year burned Canterbury and London. During these troubles Ethelwulf made a pilgrimage to Rome, with his son Alfred, where he stayed a year, and on his return found Athelstan dead, and succeeded by his next son, Ethelbald, who had entered into a conspiracy with some nobles to prevent his father from again ascending his throne. To avoid a civil war the king gave up the western division of the kingdom to his son, and soon after, summoning the states of the whole kingdom, solemnly conferred upon the clergy the tithes of all the produce of the lands. He survived this grant about two years, dying in 857.

ETHER, in philosophy. See ÆTHER.

ETHER. This term was first applied to the volatile fluid obtained by the action of sulphuric acid on spirit of wine. The earlier history of the product is obscure, but it seems to have been known, though very imperfectly, to the chemists of the sixteenth and seventeenth centuries, or at all events they performed with the requisite materials the process which would yield some ether. It seems to have been first distinctly described about 1730 by Frobenius, who also conferred on his product the name *spiritus ætherеus*, which it still bears. It gradually found its way into medicine, and ultimately into the arts, and it is now manufactured extensively, and is a regular article of commerce. See SULPHURIC ETHER.

The reaction by which ether is got from alcohol, and the part which the sulphuric acid performs, were for a long time the subjects of minute experiment and ardent discussion among the most eminent chemists. The theory which was ultimately, and is now universally, accepted explains what takes place by showing that the alcohol and acid react with each other, water and a compound called sulphovinic acid are produced. When this compound reacts with another portion of alcohol ether distils over, and the sulphuric acid is reproduced ready to go through the same operation. Hence a limited quantity of acid can convert a large amount of alcohol into ether. Further investigation has shown that other alcohols are capable of acting like ordinary spirit, and that other acids so far resemble sulphuric acid that they can form compounds analogous to sulphovinic acid. To all these bodies the term ether has been extended, so that it includes a very large and ever-increasing collection of compounds. Like other terms, however, it has been used somewhat arbitrarily, according to the general hypothesis current at a particular epoch in the history of the science.

Ethers are classified as simple, mixed, and compound. The simple ethers are the oxides of the alcohol radicles, and of these the type is common ether. Mixed ethers are also oxides, but contain two or more different alcohol radicles. The compound ethers contain both an alcoholic and acid radicle, and the latter may be either inorganic or organic. Thus sulphovinic acid above mentioned is the acid sulphate of ethyl; nitric ether is the nitrate of ethyl, hydrochloric ether the chloride of ethyl; acetic ether is the acetate of ethyl; oil of wintergreen yields salicylate of methyl, and ordinary suet is an ether containing tristearate of glycerin. The properties of

the ethers therefore vary greatly; some are volatile fluids, others are solids with high fusion points. They are more or less odorous, sapid, and inflammable. Some mix with water and dissolve in alcohol. The solid ethers dissolve in the volatile fluid ethers. Hence the use of common ether as a solvent for the oils and fats.

ETHEREGE, Sir George, one of the wits of Charles II.'s day, chiefly known as a writer of comedy, was born about 1636. He is supposed to have been for some time at Cambridge, then to have travelled, and on his return to have been entered at one of the inns of court. In 1664 he presented to the town his first comedy, entitled the Comical Revenge, or Love in a Tub; an incongruous mixture of prose and verse, but suited to the taste of the times, and which was well received. The author was immediately enrolled among the courtly wits of the day, and in 1668 brought out his next piece, entitled She Would if She Could, which was very coarse and licentious. In 1676 he produced his third and last comedy, entitled The Man of the Mode, or Sir Fopling Flutter; at which time he was, as the dedication implies, in the service of Mary of Modena, the second duchess of York. This performance was still more applauded than the preceding, and the Sir Fopling was, for a long time, deemed the ideal of the superlative beau or coxcomb of the age. Etherege's plays are little more than lively conversation pieces, with a great paucity of genuine humour or felicitous plot, and have long been placed on the manager's shelf. On the accession of James II. he was knighted and appointed envoy to Ratisbon, whence he wrote two letters to the Duke of Buckingham, which are printed in the Biographia Britannica. On the Revolution he is said to have joined his former master in France. He is supposed to have died about 1688.

ETHICS (from Greek *ēthikos*, relating to morals, from *ēthos*, moral temper) is the science which treats of the nature and laws of the actions of intelligent beings, considered in relation to the qualities of good or evil, or as it may be otherwise expressed, of the moral qualities of these actions. It is a speculative science, and like other speculative sciences is liable to a great variety of treatment. Although there is no fundamental distinction between ancient and modern systems of ethics considered purely as speculative systems, yet as speculation is always materially affected by external surroundings, and as the introduction of Christianity and the refinement of modern methods of investigation have in various ways affected the development of this science, it has been found convenient to divide the various systems of ethics into ancient and modern.

The foundations of the leading systems were laid in antiquity. Socrates taught that for the proper guidance of his conduct self-knowledge was indispensable to man. But to have a true knowledge of himself he must know the Author of his being. The knowledge of God accordingly is the source of morality. This knowledge is to be derived from his works, which show him to be wise and good. The nature of man resembles that of God, and its proper pursuit is virtue, which consists in doing what the study of his own nature and of the laws of the Creator, discoverable in the system of the universe, reveals to be right. Happiness is inseparable from virtue. Plato, the faithful disciple of Socrates, amplified and systematized the views he received from his master. He defined the Divine Nature as a union of the good, the beautiful, and the true, which are in themselves eternal, necessary, and immutable. He also analyzed human nature, and assigned to it its specific virtues, and in his Republic he made the application of ethics to politics. Aristotle was also a follower of Socrates, but in many respects he took up an independent position. In ethics he diverged on a vital point from the doctrines of Socrates and Plato. Like them, he taught that man was free and rational, but he made happiness the end of virtue. He banishes God in great measure from the world, of which he is too high and pure to take cognizance, and he makes utility the governing principle of society. He places virtue in moderation, and makes each particular virtue a mean between two extremes. Epicurus placed his system yet more broadly on a utilitarian basis. Pleasure is to be sought and pain avoided for their own sake. By an analysis of the various pleasures and pains of which human nature is susceptible, and the cost at which they are procured, Epicurus arrives at the conclusion that the chief good (maximum of pleasure) is repose of mind, together with the tranquil enjoyments which do not disturb it. The Stoics placed the supreme good in conformity to nature, that is, to the immutable laws which reason discovers in the universe. They held that only to be good which is so eternally, and believing in an infinite concatenation of causes and effects tended strongly to fatalism. They made virtue nearly synonymous with intelligence and vice with error. The active virtue of Stoicism took the form of a conflict with passion, as being contrary to reason, its passive virtue took the form of indifference to pleasure and pain as things in themselves indifferent to reason. The founder of this school, one of the most famous in antiquity, was Zeno.

In our biographies of various philosophers, ancient and modern, and in our notices of the leading schools, further details of this kind will be found, and as it would serve little purpose to give the conclusions of the different schools without an analysis of their principles, we purpose in this article to present a brief classification of modern systems, with a view to establish, if possible, as far as a mere outline will serve, some criteria by which to estimate their merits.

It is obvious that ethics or moral philosophy must be based on metaphysics or philosophy properly so called. According to the view which the individual thinker may take of the powers and relations of the mind itself will be his view of the duties and responsibilities which these powers and relations involve. We shall for the present assume only a single principle, that any system of ethics to be true must satisfactorily explain the moral facts of our nature, that is to say the beliefs in regard to morality currently acted on by mankind.

At the very outset a question arises as to the nature of the acts of intelligent beings, which is properly psychological, and which divides all possible systems of ethics into two classes according as it is answered in the affirmative or in the negative. Are the acts of such intelligent beings as we are free or are they not? If this question is answered in the negative ethics becomes merely a descriptive science. We may class certain actions as good or bad, and lay down laws as to the order of their occurrence, but we cannot make these laws available for the guidance of the actors; for the power to make the investigation of them affect any practical result would prove a certain amount of liberty. Before answering this question it is of importance that it should be rightly stated, for the negative answer is so repugnant to our natural ideas that it is much more common to reach it by a false definition of liberty than by a direct negation of it. It is not an assertion but a denial of the liberty of the will to say that it consists in the implicit consent of the will to all so-called voluntary actions. The only question at issue is the passivity or activity of the intellect

in the determinations of the will. They who deny the freedom of the will are they who assert that the actions of men are inevitably determined by antecedents, that the intellect of man is merely a repeating source of action, of which the activity, like that of winds and other natural agents, is no more in amount or duration than is imposed by the forces originating and sustaining it. They who maintain the freedom of the will are they only who hold that man's activity has its source in himself, its occasion only in external objects. Another distinction between these opposing theories which is apt to lead to misunderstanding is this: If a man's actions are necessarily determined by antecedents he is free from obligation and responsibility, consequently from the constraint of law; if he has an inherent power of action that power is subject to law and therefore to restraint, so that liberty is coincident with subjection to restraint and bondage with freedom from it. They who maintain the former theory reason thus: A man's actions are determined by his feelings, his feelings by the objects which solicit them. These objects must be contained in his consciousness, so that to know his feelings we have only to know the condition of his physical nature together with the objects contained in his consciousness, and these together constitute the determining causes of his actions. It is plain that this reasoning affirms the passivity of the reason or understanding itself, and they who maintain this position have a formidable obstacle to encounter in the universal belief of mankind, including their own sect, as to the natural source of human actions. In every communication we make to one another, in the forms of every language, in the laws of every nation, we affirm the originative power of human intelligence. When we say, 'I might have done,' 'I ought to have done,' 'He did wrong,' 'He acted shamefully,' 'It was nobly done;' when we speak with enthusiasm, with indignation, with irony of the deeds which history records of human actors, we mean, if we speak rationally at all, that all the circumstances being supposed, the actors might have done differently. When there is a railway collision, is anybody ever indignant at the engine, and is nobody ever indignant at the driver, the pointsman, or the directors? It is then clearly the common testimony of human consciousness that there is a liberty of spontaneous action in the human will. If we examine our consciousness further we shall find that so far from our actions being absolutely controlled by antecedents, or by the objects which solicit our passions, there is frequently not in our minds any object strong enough to prompt us to any action at all; so that rejecting present objects as motives of action we make spontaneous efforts to seek a new one. There is such a phenomenon as a mind judging itself too ill-informed to act aright, and dismissing all present objects as a sufficient ground of action, to turn its activity to the search of new and better objects.

The human mind presents at least three elementary powers or capacities: the power of knowing, the power of feeling, and the power of acting. But these elements, though distinguishable, are not separable. When we distinguish knowledge, feeling, and action, what we call by these names will all be found, when accurately examined, to be combinations of the three elements differing only in respect to the element which preponderates. Thus 'I know' does not mean merely, as Locke would have us suppose, that an object is tumbled into my consciousness as into a receptacle. No conceivable sort of bag would produce the phenomenon of knowledge. To produce this phenomenon requires the forthputting of an active power; this power we call intelligence. The knowledge of an object always produces some emotion of the mind in regard to it. The normal emotion produced by knowledge is pleasure. The pleasure which knowledge gives may be great or small according to the kind or degree of knowledge, but pleasure of a durable kind is naturally associated with the possession of knowledge in every intelligence. On the other hand, the acquisition is beset with difficulties, obstructions, and limitations, and these are the cause of dissatisfaction and pain, which are often so great that the mind is fain to banish them together with the whole object which excites them from its consciousness; knowledge and the emotions to which it gives rise induce those actions which, in the view of the fatalist, are their results alone, in ours the results of the inherent activity of the mind stimulated by them. Thus we find that it is not in these resultant actions alone that the mind is active. In knowledge it judges, in feeling it affects, in action it determines. To this double proof of the activity of the mind, afforded by the spontaneous testimony of consciousness, and by the observation and analysis of its operations, what can fatalism oppose but a false syllogism in which a variable premiss is made to do duty for an invariable? Because the mind is included among the objects of consciousness the fatalist imagines that his enumeration of the antecedents of action is exhaustive, but it is not the mind as an object of consciousness, but intelligence as an active power that we ask him to include in it.

Having established the position that ethics is a practical and not merely a speculative science, the thing which it becomes of most importance to determine is, What is its practical conclusion? And the first answer which we have to give to this question again divides the remaining systems into two classes. The answer which may be said to distinguish the popular and prevailing systems of the present day is what is called the utilitarian one. It may be defined generally by saying that the practical end of ethics —the chief good—is the greatest possible satisfaction of the tendencies of our nature. But although this answer distinguishes the popular philosophies of the day, it must not be received without examination. Like the theory we have just examined, it has to encounter a formidable opposition from the concurrent testimony of human experience.

Before proceeding to examine this testimony we must first fix and identify utilitarianism, for nothing is more common in abstract discussions than by an unconscious duplicity in the use of words to make them mean one thing in the exposition of a system, and another in its defence. If by the satisfaction of the tendencies of our nature we are to understand merely that there is some good towards which our nature tends, which is the end of ethics, the statement is unexceptionable; but the problem of ethics is unsolved, and we must go on to solve it by inquiring, What is this good? If, however, we are to receive this statement as a step towards the solution of the problem, as they who make it undoubtedly intend we should, it necessarily implies that the satisfaction of the tendencies of our nature, without discrimination, is a good in itself, and that all that is needed to make the solution perfect is to ascertain the amount of good contained in each, and how much of this good may be actually realized. The problem of ethics is thus reduced to one of moral arithmetic. This is the accepted position of all consistent utilitarians—of Epicurus, Hobbes, Helvetius, and Bentham.

Taking this view of utilitarianism, it may be observed here that it is chargeable either with imperfect or premature generalization. If it is known that the satisfaction of all the tendencies of our nature is a

good in itself, and therefore proper to be pursued, it must be known whither this satisfaction leads. If this is known, why not state it, and give a definite instead of an indefinite aim to morality? If it is not known whither it leads, how can it be known that it is proper to be pursued?

But a more formidable charge against utilitarianism is, that in assuming the tendencies of human nature to be as such proper objects of pursuit, it does so contrary to fact and human experience. We have hitherto spoken of man only as an intelligent being, and it is to be observed that the science of ethics has to do with man only in virtue of his intelligence. There are no ethics for irrational animals. But man has a double nature. Without going into any question as to the origin of the intellectual part of his nature, it is clear that there are in the two parts of his nature, animal and intellectual, tendencies which do not coincide. In addition, therefore, to any diversity which may exist in our intellectual tendencies themselves, there is a diversity between these and our animal propensities. It is further to be observed, that though we can clearly distinguish the difference between these two natures and the non-identity of their tendencies, we cannot by a mere act of judgment separate entirely between them, so as to say in each particular case, This is intellectual, and that is animal. Our actual tendencies, therefore, are mixed tendencies, partly animal and partly intellectual. On this account all practical moralists not wedded to a system recognize a struggle in our nature between opposite tendencies, some of which they call good and others evil, and they make morality consist in pursuing the one and avoiding the other. Two other facts are to be observed in the conclusions of practical moralists, that while moral excellence is attributed exclusively to intellectual tendencies it is not attributed to the whole of these. No moralist not a professed utilitarian ever thought of attributing any moral excellence to the gratification of any of our animal propensities. On the other hand, intellectual passions or emotions, such as anger, revenge, &c., are frequently held to be immoral. From this the reasonable conclusion seems to be, that while the gratification of our animal propensities is a thing in itself indifferent to morals, it is the occasion of exciting intellectual passions contrary to morals, and that therefore such passions exist. If this be so, all the intellectual tendencies of our nature are not all good in themselves.

In pursuance of the objection that utilitarianism rejects the facts supplied by human experience as a foundation for morality, we may further advert to the range of motives acknowledged by it; and it is here that one of the chief vices of the system appears. The charge to be brought against utilitarianism here is, that it reverses the relations of cause and effect, and in cutting off from morality one half of the motives which influence it, cuts off at the same time half of the actions which distinguish it.

When a series of connected events is found uniformly to succeed each other in a certain order, we naturally say that that which comes first is the cause, and that those which follow are the effects. Utilitarianism tells us that certain actions are good, and certain others evil only, because the former are followed by good and the latter by bad results. The natural order of sequence teaches us to say that the results are good if the action is good, and evil if the action is evil. According to the natural order the quality of an action may be distinguished in two ways. We may observe its results, and conclude its quality from them as from the effects to the cause, as we judge of a tree by its fruit; or we may observe the action itself in its origin and history, and according to the quality it here exhibits we may judge of its results. Utilitarianism recognizes only the former of these methods, and denies the latter, upon which the former depends.

Again, if happiness is the end of virtue, the motives of our actions must all regard the future. No individual and no society was ever asked to provide for its past happiness. A single true moral motive which has its source in the past thus ruins the whole scheme of utilitarianism. Now how are we to regard such a virtue as gratitude? Will it suffice to say that we ought to be grateful because otherwise men would cease to perform benevolent actions, or that we must be grateful because to be so satisfies a tendency of our nature? On the contrary, does not sound practical morality teach us that men ought to do good irrespective of the gratitude of the recipients, and that they who receive good ought to be grateful irrespective of future advantage? To say that gratitude is a tendency of our nature only means that I will be grateful if it pleases me to be so. This is not what the practical moralist says. He says that our nature tends both to gratitude and ingratitude, and that we ought to practise the one and avoid the other.

Another objection to utilitarianism which we shall not insist upon here, as it has been often and ably enforced (see in particular Jouffroy's Cour de Droit Naturel—Système de Bentham), is that it is destitute of the element of obligation, which forms an essential distinction of the morality actually believed and practised by the bulk of mankind, as exemplified in the expressions, 'I ought,' 'I must,' and that wanting this element it is necessarily sterile in its practical application; so that the end which it proposes cannot be transferred by generalization from the individual to society, and that utilitarians are guilty of a logical inconsequence in so extending it.

When I am told to seek the satisfaction of the tendencies of my nature I recognize something which may be highly desirable and expedient, but I do not recognize anything obligatory. Moreover, the obligation to seek the greatest satisfaction of my individual tendencies is not consistent with the obligation to seek the same, or any other good, for society. Society lives by the repression of individual tendencies, and it often requires sacrifices from individuals which it cannot repay. Utilitarianism then must choose its end: if it places this in the satisfaction of the individual it cannot transfer it to society; if in the highest good of society what utilitarian motive compels the individual to promote it? Friendship, patriotism, and philanthropy, all the disinterested and impersonal virtues, are inconsistent with utilitarianism. The mere entertainment of an interested motive destroys them.

But though utilitarianism does not admit of a logical it does to some extent admit of a practical generalization of its end. There are practical utilitarians, and there is a standard of virtue created by their practice, and which is its natural result. Flagrant immorality is adverse to a man's success in life, but a more strict morality than is required by the society in which he moves is also adverse to it. In every society there is what may be called a mercantile standard of morality, to go below which is not safe, to go above it is not profitable. This is the standard of utilitarianism, because it is the point at which individual interest coincides with the interest of society. Taking society as it exists this standard would hardly satisfy an exacting moralist; but we can hardly realize from society as it is what on a thorough application of the utilitarian principle it might become. As long as there are people who believe that virtue ought not to be practised from

interested motives the standard is raised artificially, and utilitarianism, having no fixed social standard of its own, is compelled to comply with it.

Another theory of ethics places the moral principle in the sentimental part of our nature. We must pass over the interesting speculations of Adam Smith and Sir James MacIntosh. More amiable than the theory of utilitarianism this hypothesis is not more sound, and the same criticism suffices to expose its invalidity. In placing morality in instinct it fails to recognize in it the essential elements of law and obligation by which the morality that operates in human experience is distinguished.

The remaining systems are those which recognize that the ideas of law and obligation can have their source only in reason. There are still great differences in the development of these systems, and they cannot be treated in the same manner as those we have already considered. The practical moralist can determine that morality consists not in the satisfaction of the tendencies of our nature as such, but on the government of these tendencies by reason. He can also perceive that reason judges between these tendencies, and recognizes an excellence in some which it does not recognize in others, and that the greater satisfaction of the tendencies themselves is not the sole ground of these judgments; but when we come to inquire what is the source of the laws by which reason governs our actions, and in what these laws consist, we reach questions which can only be answered by an examination of the psychological grounds of ethics too extensive to be here entered on. We shall only indicate a few results which we believe may be established.

We may go a step further in our deductions from practical morals, and say that the ethical notions commonly held and acted on by men have a common and easily recognizable source in the belief in a Supreme Being. It is this belief which gives the sanction of obligation even to the utilitarian motive itself; for, if I believe that my being originates in the will of a Being of infinite perfection, I naturally conclude that there is some perfection to which my being tends, and that I am under an obligation to seek it. It is this also which reconciles the conflicting claims of self-interest, and of the good of our neighbours, which it would otherwise be a matter of the extremest difficulty to adjust, and this gives a broad and sure foundation for society.

The idea of a Supreme Being may be the source of the moral notions of an individual in either of two ways. He may deduce these notions himself from that idea, whether conceived by himself, or communicated to him by another, or he may receive the notions from those who have so deduced them. In like manner the idea of a God may be formed in the mind of the individual who holds it as a deduction of reason, or it may be communicated to him by others.

However this idea originated it actually exists, and there are only two possible ways in which the human race can have become possessed of it. It must either have been conceived by some individuals as a deduction of reason, and communicated by them to others, or it must have been communicated to some individuals of our race by a superhuman authority, in other words by revelation.

There is nothing repugnant to reason in the idea of a revelation. If we receive ideas on the most important subjects from one another, why should we reject ideas which may be communicated to us in like manner from a higher source? But a revelation is possible only on one condition, that it should be consonant with reason. Whether, therefore, the idea of a God comes to us from reason or revelation it depends upon reason alone to receive it. If it is deduced by ourselves we must have the power of reasonably deducing it, if it is communicated we must have that of reasonably assenting to it.

We hold with Descartes, the father of modern philosophy, that we have this power, and we hold also that it is from the recognition of our relationship to God that the orderly development of moral ideas proceeds. We hold that the existence of God is a necessary truth of reason. We do not mean by this that it exists *a priori* in human intelligence, for then all men would have it; but that it is a necessary result of the due exercise of that intelligence upon the problem of its own being, in the same manner as the truths of mathematics are necessary deductions of reason to those only who examine the evidence on which they depend.

ETHIOPIA, or ÆTHIOPIA (Greek, *Aithiopia;* Hebrew, *Cush*). The terms Ethiopia and Ethiopian were anciently used in two distinct senses. First as a generic designation applied by the earliest geographers to all the dark-coloured races of Africa, or even of Africa and Asia. Herodotus used it in the latter sense. Secondly as the general name given to the countries lying to the south of Egypt and Libya, and extending from the Red Sea to the Atlantic Ocean. In a more restricted sense it comprehended the modern country of Nubia and part of Abyssinia, and had Meroe for its capital, but its limits were not very clearly defined. The principal tribes or races of the Ethiopians known to the Greeks and Romans were the Blemmyes and Megabari, agricultural races; the Ichthyophagi, or fish-eaters, who dwelt on the sea coast; the Macrobii, or long-livers; the Troglodytæ, or dwellers in caves. The Greek and Roman accounts of Ethiopia are not only very vague, but frequently filled up with fable. The history of ancient Ethiopia is closely connected with that of Egypt; its details are in a great measure fabulous, but it appears to have been a very powerful and early civilized nation, and according to some the arts and sciences descended from thence into Egypt. Ethiopia is mentioned in the Bible as in close connection with Egypt, and on two occasions the Ethiopians even appear in the field of Jewish history. The first of these was in the reign of Asa (about B.C. 955), against whom Zerah the Ethiopian came with a great host, and was defeated and driven back at Mareshah, in the extreme south of Palestine. The second occasion was in the reign of Hezekiah, when Tirhakah, by making war against Sennacherib, helped to divert the attention of the Assyrian monarch from the kingdom of Judah. By Ethiopia in this connection we must understand Ethiopia and Upper Egypt combined. Almost the only other allusions made in Scripture to Ethiopia refer to the natural characteristics of the country, and the commerce in which its people engaged.

The ETHIOPIAN LANGUAGE or *Geez*, the literary and ecclesiastical language of Abyssinia, is a Semitic language allied to the Arabic, and was introduced by the settlers from south Arabia. It became the official language of the country, but was supplanted in the fourteenth century by the Amharic, through a change of dynasty, after which it died out as a spoken language, and maintained itself only as the language of literature and the church. It resembles in many respects the Aramaic and Hebrew, as well as the Arabic, but has many peculiarities of its own. It has twenty-six consonants, and seven vowels, which latter are always written, and it is written from left to right, thus differing from the other Semitic languages. The Ethiopian literature begins after the introduction of Christianity in the fourteenth century, and is chiefly connected with the

church. The principal work is a translation of the Bible, including the Old and New Testaments, and Apocrypha, to which are appended some non-canonical writings, such as the Shepherd of Hermas and the Book of Enoch. For the Ethiopian or Abyssinian Church, see ABYSSINIA and COPT.

ETHIOPS MINERAL. A name given by the old chemists to the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold. *Æthiops martis* or ethiops of iron was the black oxide got by exposing iron-filings and water to the air.

ETHNOLOGY (from Greek *ethnos*, a people or nation, and *logos*, a discourse), the science of man. The word anthropology (*anthropos*, man) is adopted by many as a synonym. Both words are English-made compounds of Greek elements. The Greeks had no such compounds, because they knew no such science. Some scholars affirm the word anthropology to be more correct to name the science of man; but they forget that the science is not that of man as distinguished from animals, but of man as a race, people, and nation. The earliest ethnological chart in the world well expresses it in tabulating the several descendants of the three sons of one man, Noah, 'These are the sons of Shem, after their families, after their tongues, in their lands, after their nations' (Gen. x. 31). This chart traces the descent of peoples from Noah, but wide differences of opinion exist as to the identification of some of the peoples named in it. This chart, though it was understood in early times, is only partly understood now. Man is now dispersed over a much larger area of the earth's surface than he was in the time of Moses. This chart is silent as to the ancestral stock of the American Indians, the Australians, the Polynesians, and other peoples, and affords no clue to determine their descent from Noah. Such a chart cannot be constructed for these nations. All that can be done is to study them as they are, and endeavour to trace them back to their origin.

Some writers maintain that each region of the earth was originally supplied by a distinct creation, with its own stock of plants, animals, and man. This idea was current amongst the Greeks and Romans, although it existed along with the pagan tradition of a primitive pair fashioned out of clay by Jupiter. The prevailing opinion in modern times refers all nations to a common parentage. This, no doubt, is chiefly due to Biblical authority, for the mass even of the educated public are unaware of the amount and value of the scientific evidence which underlies and supports the inference that all the diversities are merely such variations as may occur in a species. And this opens up a large question in natural history, namely, the definition of a species. What is a species? This has been ably discussed by naturalists. There is no room to quote the facts and arguments of the question, although they are highly interesting; but we may take that great principle upon which all are agreed, namely, that all the descendants from common ancestors, whether plants or animals, are of the same species as the ancestors. Thus our common sense is satisfied that all the descendants of Noah recorded in Genesis x. are of the same species as Noah. All the descendants of Shem, whatever may be the countries in which they located themselves, are of the same species as their great ancestor Noah. All the descendants of Japheth, in like manner, are of the same species as Noah, and so are all the descendants of Ham.

The old heathen view of local creations appears to be revived both on the Continent and in England, and is maintained by some eminent men of science; but the fashionable revival of the period is Lamarck's theory of the transmutation of species by development, so that all are developed in an ascending series from the lowest and simplest organism up to the anthropoid apes, which were developed into men. This theory of man's origin is but a vague speculation, and is really believed in by few.

Some writers speak of the Adamic race as one among many distinct races of men, but writers in general preserve a discreet silence on ethnology before the flood. Antediluvian history is limited to the first seven chapters of the book of Genesis, and this history comprises a period (see chap. v.) of nearly 2000 years. Outside the Bible there are no records of this period. The recently discovered clay tablet from the library of the Assyrian king Assurbanipal is a copy of an old Babylonian tablet, which records probably the Noachian deluge, but there are no records of an earlier date. And there are no facts known of this period for the ethnologist to discuss. The worked flint instruments found in the drift and other superficial strata, and the fossil human bones found buried at great depths are evidences of the existence of man in very remote times, but the chronological evidence as to when these men existed is far too vague for discussion. Ethnology proper can only date from Noah.

The precise date of the flood is unknown. The chronology of ancient secular history is a difficult study, and that of the sacred history contained in the Bible is no less difficult. The chronology of the Hebrew Bible is preferred to that of the Samaritan, and that of the Septuagint has few advocates. It is well known that the chronology inserted in the margins of our Bibles is a compilation made from the text of the Bible by the celebrated Dr. Ussher, who was Archbishop of Armagh about two centuries ago, but it is less known that his work is a posthumous publication. Other systems of chronology have been compiled from the sacred text by eminent and learned divines, which greatly differ from that of the archbishop, so that in rejecting his chronology we do not reject that contained in the sacred volume.

The chronology of Greece, Rome, and Persia reaches back to the fifth century before Christ, but that of the Israelites reaches back, with details and certainty, to upwards of a thousand. The building of the temple of Solomon was not less than 1010 years B.C., prior to which the reign of David lasted forty years, and that of Saul nearly fifty years, so that there are details for upwards of 1100 years B.C. Beyond this period the chronological data are so vague as to leave room for great diversities of opinion as to the dates of the great eras.

Egyptian history gives points of contact with Hebrew history in centuries beyond the reach of Greek and Roman history. And the historical inscriptions of Assyria and Babylonia abound with such points of contact. It will be borne in mind that the Egyptian history consists of the original records on the monuments, so that they are free from the errors of transcription. And the histories of Assyria and Babylonia are original records on stone, or on clay tablets, so that they are equally free from such errors. Now on Egyptian monuments there are representations of Egyptians, Negroes, and Asiatics of Western Asia engraved and painted on the stone fully 2200 years before Christ, with precisely the same features and complexions as exist at present in living men. According to Archbishop Ussher's view of biblical chronology these monuments were in existence three centuries before Abraham, and only 150 years after the flood. It is difficult to believe that the descendants of Noah could have become so completely modified in physical characters in the short space of 150 years as from Western Asiatics to become Egyptians

and Negroes in all the physical characters of those races. And it is not alone the physical characters, but the complete system of religion and the ancient language of Egypt, both of which, according to Archbishop Ussher's view of biblical chronology, must have arisen in the same 150 years. From what is known of the influence of climate in modifying the physical characters of man in America and Australia, it is obvious that no one can believe that such vast modifications could be effected in 150 years. That such changes, physical and lingual, took place in the descendants of Noah is unquestionable, if we receive as genealogy the 10th chapter of Genesis, only it took a longer time than 150 years to effect. Happily the text of the Bible does not limit the period to that of Archbishop Ussher. The unity of the human race is a part of the Hebrew religion, and is also closely interwoven with the Christian faith.

When travellers explore new lands they mostly find them to be inhabited; thus when Britain became first known to the Romans it was found to be inhabited; so America, Australia, and the various groups of islands in the Pacific Ocean, from the Sandwich Islands and Easter Island to New Zealand, were all found to be inhabited.

It is a remarkable fact, that the populations of all countries speak of having come from some other country than that in which they are found. In Ireland the received, which is indeed a boasted, tradition is of an eastern origin. The date of the migration westward is unknown, the numbers who migrated are unknown, the locality whence they issued is unknown, the route is unknown, the time occupied in the migration is unknown, indeed nothing whatever is known of the details, and yet the tradition is received by both the educated and the uneducated alike. The tradition is unquestionably true. They came from the East, and so did the whole of the original colonists of Europe. The traditions of the New Zealanders, on their migration, are full of interest. Those of some of the Indians of North America, especially the Mandan, are also full of interest. In fact all such traditions of human migrations are interesting in themselves, and infinitely more so as they relate to replenishing the earth.

Wherever man is found he is always man. He may differ physically as much as possible from the European, who is commonly taken as the standard, but no one confounds him with apes, or with any other creature. And wherever found he possesses those mental characters which belong to the human family. He has verbal language, and speaks his thoughts and feelings to his fellows. His fellows understand him, for his thoughts are common to the human family. He knows the present, he remembers the past, and anticipates the future. He knows there are powers greater than his own. His understanding recognizes the operation of such powers, both around him and above him. The sun, and the moon, and the stars, and the clouds, and the warmth, and the cold, and the lightning, and the thunder are each and all well known to him, for which he has names, and are subjects of his discourse. His views of these great subjects may be very erroneous, but as man he has some views concerning them. His feelings also are common to the family of man. He loves and hates; he appropriates to his own use and he gives for the use of another; he hopes and fears; he reverences; he prays, and looks with awe upon those to whom he attributes the exercise of those great powers, which he knows to be greater than human. Language and religion, the earliest results of the mental powers, are essential characters of man as man.

Wherever man is found he lives in society. The family is the lowest unit of society. The next is an assemblage of related families constituting a tribe. And the next a union of tribes constituting a state. The family unit is persistent in both the higher units, but the tribal unit mostly becomes merged in that of the state; still it may remain, as in the Hebrew tribes under the monarchy, as in the tribes of ancient Rome, and in the clans of the Highlands of Scotland. The Bible contains the Hebrew records of the rise of the Hebrew state from the family unit, that of Abraham. History can supply no similar example. When the zoologist describes ethnology as the natural history of man, he only partly describes it, for a history of man written as a zoologist writes that of the elephant leaves the most important parts of the subject untouched. The zoologist describes the elephant as he is found in Africa and Asia, including the Malay Islands, and ends there. The ethnologist describes man wherever he is found, with all his peculiarities of physical structure and mental constitution, but this is only the basis of a wider and deeper inquiry concerning him. He studies man in groups, as a people, a nation, and a variety. He proceeds to study the history of those peoples, nations, and varieties, tracing them back as far as history is able to conduct him. He endeavours to discover whence those peoples, nations, and varieties are derived, their origin in preceding peoples, ever seeking for their affinities, and struggles after that knowledge in the dim and shadowy time before the dawn of history. The ethnologist adopts the results of many distinct inquiries, both physical and moral, concerning man, as instruments to forward his own great inquiry. He sees the powerful influence of climate in modifying the physical characters of the domestic animals, and he immediately asks, What is the effect of climate on man? He sees that the Americans, that is to say the descendants of European colonists, have been much modified by the two centuries of American climate to which they have been subjected. The modifications would require to be described by a naturalist possessed of anatomical knowledge to be accurate and full, but a common observer never fails to observe the change of complexion, with the diminished fleshiness of the lower lip and the cheeks. The Americans have all the appliances of civilized life, which must much diminish the effect of climate to which the Indian without such appliances is subject.

The ethnologist adopts the results of philological science to aid him in his great study. The science of philology determines the relationships of contemporaneous languages to each other, and their relationships also to preceding languages: thus the Italian and Spanish are both derived from the Latin language, and they are related to each other as descendants of a common ancestor. We know both the ancestor and offspring, but if the Latin language could be blotted out of existence and memory, it could not affect the philological conclusion, that the Italian and Spanish are descendants of the same ancestor. Now in many cases the ancestral language is unknown, being lost to history, and yet the derived languages can be proved to be descendants of this unknown ancestral language, as the Sanskrit, Latin, and Greek are proved to be related to each other as descendants of a common ancestor, that ancestor being entirely unknown, except as the ancestral language.

The languages now existing in the world are very numerous, and each represents a line of ancestors, so that the total number of languages to be studied by linguists is very great. The class of languages best known is the Indo-European or Aryan family, for an account of which see the articles INDO-EUROPEAN and PHILOLOGY.

The ethnologist adopts also the results of the study of mythology to aid him in his great study. Religion is one of the earliest results of mental manifestation, and man in his migrations takes with him his language and his religion. They are indeed parts of his identity. They are powers which he cannot escape, but which he can yet modify. It is a presumption that peoples having the same or a kindred mythology are kindred peoples, and hence the value of the results of the study of comparative mythology as a line of evidence in ethnology.

EUROPE.—The ethnology of Europe is connected with that of Western Asia. The two continents are continuous, and it is difficult to describe the peoples of Europe without reference to those of Western Asia. The Aryan race is spread from India westward over nearly the whole of Europe. If the grammatical forms and primitive vocabularies of the Sanskrit, Zend, Persian, Greek, Latin, Slavonic, German, and Celtic languages be compared together, the philological statement will be verified, that they constitute a group of related languages. (See the article PHILOLOGY.) Competent scholars have verified the statement, and ethnologists hold that such affinity of languages is evidence of the same affinity of the peoples who speak and spoke those languages. The physical differences between Germans and Italians, Greeks and Persians, Indians and Englishmen, Romans and Irishmen, Welshmen and Scotchmen, and each from the rest, are so great as to induce many students to challenge the truth of the proposition of their descent from a common stock, and consequent relationship. But physical differences are apt to arrest the attention of students, and to be unduly estimated. The various populations of Europe at the dawn of its history appear to have occupied areas situated relatively to each other the same as now, but some have much encroached upon the area of their neighbours; thus the people called *Keltoi* by the Greeks, and *Galli* by the Romans, the Gauls of Roman history, occupied a vast area in Western Europe, which has been almost absorbed by the Germanic and Latin races.

The ancient Gauls are described by Ammianus Marcellinus as tall, very fair and red haired, horrible from the fierceness of their eyes, fond of strife, and haughtily insolent. Their voices are threatening and terrific when calm as well as when angry. In a brawl the man is aided by his powerful and blue-eyed wife. Boldness, levity, fickleness, lack of firmness and self-control, are stated by all ancient authors to be predominant characters of the Gauls. They are fond of ornament and display. They wear bracelets on their arms and wrists, and are fond of dyed robes and embroidery. They are good agriculturalists, and practise many arts. This description applies to the Celts of Britain, as well as of the north of Europe. But Tacitus has informed us that the Celts differ in different parts of Britain: thus the Silurians have dark complexions with curled hair, the Caledonians are of huge limbs with red hair, but the people only of the south of Britain are like the Gauls of the Continent. Now what are the physical characters of the Celts of the British Islands? In South Wales, as in Glamorganshire and Monmouthshire, dark complexions and eyes predominate, and the stature is scarcely the middle height; while in North Wales light or fair complexions and blue eyes predominate, with a taller stature. The Caledonians and the Gaël were fair and yellow haired like the Celts of Gallia, but these characters do not predominate now. In ancient times the Celts, Saxons, Danes, and Normans are all known to have had fair complexions with light hair and blue eyes, but the descendants of these peoples in Great Britain are not so characterized. It is certain that the physical characters prevalent in Great Britain differ from those of the original tribes who are known to have constituted the population.

Italy.—History relates the gradual subjugation of Italy by the Romans. The description of the conquered is given by the conquerors, who annexed them to the growing state. Many notices of these ancient Italic nations occur in ancient authors, some of which have been collected by Dr. Prichard. The Umbrians, who occupied the chief part of North Italy, and were called *Ombroi* by the Greeks, have been represented as Celts by some, and Scythians by other authors. The Umbrian inscriptions, however, prove that the people spoke a language allied to the Latin. A good account of the remains of the old Italic dialects, except the Etruscan, is given in Donaldson's Varronianus. The Oscan language, which Niebuhr supposed to have supplied a non-classical element into the Latin, has long been shown to have been a cognate dialect of the Latin. All the languages of ancient Italy, except the Etruscan, are dialects of one language.

The Etruscans are stated by most ancient authors to have been an intrusive people in Italy. They were called Tyrrheni or Tyrseni by the Greeks. The Romans called them Etrusci or Tusci. They were a people of high civilization, and of much higher antiquity than the Romans, by whom they were subdued. The vestiges of the language are few, and have as yet resisted all attempts to translate them. The Romans termed them *Barbari*, a term which they never applied to the Sabines, Oscans, or Umbrians, and which meant that they spoke a language entirely alien to their own. It is certain that the Etruscan language does not hold the same relation to Latin that is held by the Oscan and Umbrian. But however different the glossary may be, it is equally certain that the grammatical inflections fully justify the philologists in connecting it with the Aryan family of languages. The writer of this article, after a laborious examination of the Etruscan question, considers the language, on grammatical data alone, to be cognate with Latin, but far more remote than are either the Oscan, or Umbrian. And he deems it to be Italic rather than Pelasgic.

The Italians are described as of an elegant, light, and graceful form, tallish and slender, with regular and handsome features, of an intellectual and lively expression, dark complexions, eyes, and hair, which indeed characterize the Spaniards and natives of the south of Europe generally. (Pl. LXIV. fig. 9.)

The incidental expressions found in the writings of Roman classical authors indicate the same physical characters to have prevailed in ancient Italy, light complexions being very uncommon.

Greece.—The early history of Greece is a large and fascinating subject to investigate. How little is known of the people and their arts in the time of Homer! Prior to Homer the language and mythology were in existence. The ancient Greeks themselves desired to fathom the mystery of their origin. From Greek sources it is inferred that the Pelasgi were the original stock whence the different stems of the Greek population arose. But who were the Pelasgi? The Horæ Pelasgicæ of Bishop Marsh is probably the best work for the citation of Greek authorities on the origin and history of the Pelasgi. What language was spoken by the Pelasgi? This question was proposed by Herodotus, who confessed his inability to solve it, and yet, as Bishop Marsh shows, supplies the means of its solution. According to Herodotus, Greece was not called Hellas until after the Trojan war, and was called Pelasgia before that period. The only Hellenes mentioned by Homer are those who came with Achilles from Phthiotis. Thus Hellas and Hellenes in the time of the Trojan

war were limited to a district of Thessaly. The rest of the army of Agamemnon, whatever names they bore as tribes or contingents, were Pelasgians. It was the habit of Greek authors to designate as Barbarians all who were not Hellenes; but Thucydides says they could not then be so designated, because all the Greeks were not then named Hellenes. The new generic name had not then been adopted for the old generic name. Herodotus calls the Greeks of his day Hellenes, and the Greeks of the period of the Trojan war Pelasgi, so that it is merely two names for one people at different periods of their history. And hence it is impossible to escape the conclusion that the language also was the same, and that the Pelasgian was the archaic form of the Greek of Herodotus.

Dionysius of Halicarnassus, who was a man of versatile talents, profound, and of great ability, took more pains than any other Greek writer, says Bishop Marsh, to discover the origin and history of the Pelasgi, and at last in despair termed them *αὐτόχθονες* (*autochthones*), that is, originally produced in the land. The Greek authors carry us up to Homer, and allowing the state of things recognized by him to represent the state of things for three centuries before the siege of Troy, we find ourselves beyond actual history and groping in the twilight of Pelasgian tradition. The Hebrew ethnological chart of Genesis x. comes now to our aid, and carries us back to primeval times. The author well knows the difficulties in the way of fully understanding the whole of this chart, but parts of it may be rightly understood with an ordinary degree of attention, combined with adequate scholarship and reading. On the origin of the Ionians he believes there can be no reasonable doubt, and the Septuagint version of the Hebrew Bible is valuable evidence on the subject.

'The sons of Japheth; Gomer, and Magog, and Madai, and Javan, and Tubal, and Meshech, and Tiras' (Gen. x. 2). Javan, in Hebrew written יָוָן, pronounced *Yavan*, was the fourth son of Japheth. The translators of the Septuagint wrote as nearly as they could the proper names of the Hebrew text in Greek letters, and the Hebrew יָוָן (*Yavan*) was written Ἰάονες (*Iaones*), which was understood to be the Ionians. And the restoration of the Pelasgic digamma to its place, Ἰάϝονες (*Iafones*), makes the word still more like the Hebrew. Herodotus says the Ionians of Asia Minor were Pelasgi (i. 56). The Hebrew יָוָן (*Yavan*), of Isaiah lxvi. 19, and of Ezekiel xxvii. 13, is not transliterated into Greek letters in the Septuagint, but is written ἡ Ἑλλάς (*Hellas*), the name borne by the Pelasgi after the Trojan war. The יָוָן מֶלֶךְ (*melek yavan*), King of Javan, of Daniel viii. 21, is translated βασιλεὺς Ἑλλήνων (*basileus Hellēnōn*), King of the Greeks, which refers to Macedonia and Alexander the Great. This view of the origin of the Greeks was familiar to the translators of the Septuagint near 2200 years ago, and to the Hebrews in Judea for many centuries before that. Josephus says the Ionians in Asia Minor and all the Greeks are derived from Javan.

The personal appearance of the ancient Greeks has been described by authors from Homer downwards, and represented by artists, so that we are well acquainted with them. The same variety of complexion is described as is found among the modern Greeks. Fair, ruddy, and dark complexions, with golden, auburn, and dark hair, blue and dark eyes. They are generally tall and well formed, active, and strong. They have bright sparkling eyes, beautiful lips, and regular teeth. M. Ponqueville says, the models which inspired Apelles and Phidias are still to be found among the inhabitants of the Morea. Although there are degrees in their beauty, yet all may be deemed to be handsome. The Spartan woman is of fair complexion, slender build, but with a noble air. The Messenian woman is short of stature, plump, with regular features, large blue eyes, and long black hair. The Arcadian, in her coarse woollen garments, much conceals the regularity of her form, but her expression of countenance is that of simple purity. The Arcadians lead a pastoral life; they are still Arcadians. The Laconians differ both in manners and address from their Arcadian neighbours. The men of Sparta are restless, fiery, and fond of strife. They are tall, some are fair complexioned, and have noble features. They have retained the character of the Dorians of Sparta in their propensity to rapine. The women have long flaxen hair, are of elegant form, regular features, with large blue eyes and long eye-lashes.

The Greek sculptures are admitted to be evidence of the beauty of physical form of the Greeks. They are essentially works of art, of which the original is Greek nature. The Aphrodite may not be a *fac simile* of any one model, it may be the collected beauties of many idealized, but the beauties were around for the artist to select and adopt. The public games supplied the Greek sculptor with his models, whence he produced his Ares (Mars), Apollo, and Hermes (Mercury), and if he had not been acquainted with such nature, he would not have produced such art. The personal appearance of the modern Greeks is exemplified in Pl. LXIV. fig. 6.

Germany.—The early history of the German race is very obscure. It consists of many tribes, which may, however, be divided into two groups—1st. The Scandinavian family, consisting of the Northmen, the ancestors of the Icelanders, Norwegians, Danes, and Swedes; 2d, The great Teutonic stock, in its three sub-divisions of (1) the Saxon or Western German, (2) the Suevian or High German, and (3) the Gothic or Eastern German. The geography of ancient Germany is but vaguely known, but Germany is stated to have been bounded on the south by the Rhine and the Danube, on the west by the ocean, on the north by the islands (for such they were supposed to be) beyond the Baltic, and on the east by the Vistula. But German tribes existed beyond this area, both east and west, for some were in Sarmatia, which was beyond the Vistula, and some were in Gaul, which was beyond the Rhine. And non-Germanic tribes occupied parts of the area, as the Celts of Bohemia and the Hercynian forest.

The classification of the people is that of the dialects. The Scandinavian languages form a well-marked group, having their own characteristics, which distinguish them from the other German languages. The languages spoken in Denmark, Norway, and Sweden, are descended from the Old Norse, which is often called the Icelandic, because it is still spoken in Iceland, and is nearly unchanged during the thousand years of its existence there. This remarkable fact in linguistic history may be verified by a comparison of the present Icelandic language with the literature of the Sagas. All the other Germanic languages are descended from, or connected with, the Mœso-Gothic, into which the Bible was translated by Bishop Ulphilas, in the fourth century of our era. But fragments only have come down to us, which, however, are of the utmost value, not so much for their high antiquity, for specimens of Old Saxon and other dialects of the same age are known, but for its possessing several ancient forms, which have disappeared from other ancient dialects, and which affiliate the Gothic to the Sanskrit especially, and to other members of the Aryan family of languages.

Ancient authors describe the German nations as

consisting of people of tall stature, robust build, with fair complexion, red hair, and blue eyes. They were warlike. Josephus represents Agrippa as saying to the Jews, 'Who among you has not heard of the multitude of the Germans? You have often observed their prowess and their large stature' (Bell. Jud. ii. 16). Strabo says they scarcely differ from the Celtic race, in their roughness of manners, their greatness of stature, and yellowness of hair. These, then, were the physical characters of the Germans at the period of their wars with Rome, but classical authors supply no information concerning the form and size of the head.

Niebuhr observes that the Germans are no longer red-haired, and the French descendants of the Gauls have lost the yellow hair of their forefathers. The Germans have not retained the physical characters so well described by classic authors. The climate of Germany has undergone a vast change, which is attributed by physicists to the destruction of the Hercynian forest. The extent of this forest was from the fountains of the Rhine to Rügen on the Baltic, whence it reappeared and covered Finland. The northern coast of Germany consisted of morasses, which were subject to frequent inundations. The continuity of the forest has been broken, the land cleared, cities built, and the whole face of the country changed. This change has been accompanied by a change in the physical character of the people. They are now assimilated to their neighbours, but still fair complexions, with light hair, remain features of the Germans. (Pl. LXIV. fig. 8.)

Niebuhr and Chevalier Bunsen agree that the Scandinavians best illustrate the description of the Germans given by Tacitus. The fair complexions, flaxen hair, and blue eyes of the Danes and Swedes are remarkable characters of those nations, and attract the attention of even casual visitors to those interesting countries.

Lithuania.—The Grand-duchy of Lithuania had a dialect of its own, but closely allied to the Lettish and Old Prussian. The three form a group of people speaking dialects distinct from, yet allied to the Gothic on the one hand, and the Slavonian on the other, but rather more nearly allied to the latter. The old Prussian grammatical forms are very similar to the Sanskrit, even more so than the Gothic is. The Lithuanians occupy but a small territory, and the language is spoken chiefly by the peasantry, for Russian and German have superseded it among the proprietors. The people cannot physically be distinguished from their neighbours.

Slavonia.—The home of the Slavonians may be called Slavonia, which consists of the greater part of Europe east of the Vistula. The history of the Slaves begins from a recent date. The Germans are known from three centuries before the Christian era, the Slaves from only three centuries after it. No greater offence can be given to a Slavonian than to call him a Sklavonian, yet that is the name given by the historian Procopius. The Slavonic derivation is from *slowo* = the word, which is said to show their love of literature. The Slavonian race is commonly divided into two great branches, first, the Antes, or eastern branch; and second, the Slavini, or western branch. The Antes consist of the Russians, Servians, Croats, and Wends. The Slavini consist of the Bohemians, Slovaks, Poles, Sorabians, and Northern Wends. The Slavonian languages are little studied out of the areas in which they are spoken. They are all closely connected with the old Slavonian, which is the ecclesiastical or ancient literary dialect. The Russian, with its three well-marked dialects, is spoken in Russia; the Illyrian in Bulgaria, Servia, Bosnia, and Dalmatia; the Croatian in Croatia; the Wendish in Carinthia, Carniola, Stiria, and Eisenberg. The western dialects are the Slovakian, spoken by the Slovaks; the Bohemian in Bohemia; the Wendish in Upper and Lower Lusatia; the Polish in Poland.

The physical characters of the Slavonians are like those of Europeans generally, and it would be difficult to distinguish them from their neighbours. They differ, however, from each other. The Russians, especially in the north, are fair, with light-brown, or flaxen, or red hair (Pl. LXIV. fig. 7). The Croats and Servians are of dark complexion, with dark eyes and hair, as are most of the Slavonians in the south-east of Europe. The Slovaks of Hungary are of the middle height, strong built, rather light complexion, broad faces, with long flaxen hair. In some districts there are very fine and handsome men; some of the peasant women are pretty, until the out-door labour and exposure to the weather deprives them of it. The Russians are above the middle stature, well formed, but not so strongly built as the Slovaks. The Poles vary in complexion, many are dark, with dark eyes and hair, and tall well-made men.

The Aryan people originated in Western Asia, and spread themselves both eastward and westward. They came westward in tribes, not as political nations, tribe following tribe, the earlier tribes pressed forward by later emigrants. The Celtic tribes were the first settlers, and the Slavonic tribes the last. The Celts have left conclusive evidence of their occupation of Central Europe, but no Celts are there now, they are all in Western Europe. The question occurs, 'Was Europe inhabited before the arrival of the Celts?' If so, by whom? America was inhabited before the first European colonists settled on its eastern coasts, and the original inhabitants have been pressed towards the west ever since. The Indians have been diminishing in numbers since then. Is this a repetition of what took place in Europe, in that remote age when the people who long afterwards became known as Celts began to settle and colonize it? There is no history to inform us, for the colonization of Europe by the Aryan race was effected in prehistoric times.

The Non-Aryan Peoples of Europe.—There are two races in Europe, the Finns and the Basques, both distinguished from the Aryan race, and both quite distinct from each other.

1. *The Finns.*—An extensive region in the north of Europe has been the abode of the Finn and allied tribes, which the German people and the Slavonians of Russia found there, and whose territory they encroached upon.

The Finn peoples are Mongolians; they occupy disconnected areas now, but formerly a vast continuous territory in the north and east of Europe, and across the Uralian Mountains, stretching across the north of Asia to the Mongolian Empire. Russia in Europe was formerly occupied by Finn tribes, until it was encroached upon by the Slavonian conquerors; and much of this occupation of Finn territory took place long prior to the foundation of the Slavonic Russian Empire by Rurik the Scandinavian, a thousand years ago, and probably even prior to the time of Herodotus. The civilization of the Finn peoples, their agriculture and commerce, especially those of Biarma, now Perm, are recorded by our King Alfred, and are celebrated in the Sagas. The Finns of Finland are a cultivated people, and their language, which is refined, soft, and musical, is eminently a language of poetry and song. The Finns are of middle stature, fair complexion, and generally flaxen, red, or light-brown hair. They have none of the Mongolian characters about them, nor have any of the tribes on the Wolga.

The Lapps have the Mongolian eyelid, are shorter

than the Finns, with dark complexions, and generally dark-brown hair. (Pl. LXI. fig. 8.)

The Hungarians.—The courageous, energetic, handsome Hungarian is a Finn. His language, both in its grammar and vocabulary, is Finn; and after a thousand years of separation not only is it Finn, but Vogulian Finn. A comparison of the Hungarian with the present Vogulians of the Ural Mountains teaches us much on the effect of climate. It is historically known that some of the Vogulian Finns, being pressed upon by the Turk tribes of Petcheurgers and Chasans, sought refuge in the plains of the lower Danube, in the reign of the Greek Emperor Theophilus, between the years 829 and 842 A.D. M. Zeuss has traced their subsequent career in the writings of Byzantine and Russian historians. They call themselves Magyars, but the Russians call them Ugri, as other Finns are generically designated by them.

2. *The Basques, or Biscayans.*—This race occupies a considerable extent of country on both sides of the Pyrenees. They are distinct from the people of France and Spain. They call themselves Euskaldunac, and their language Euskara. Some writers state the language to belong to the Celtic family, others to the Finn, and others to the Indian languages of North America, but all these views are rejected, and the language is still unplaced. Larramendi supposed them to be descendants of the Cantabri, who so long resisted the Romans, but Humboldt denied it. Several writers assume them to be descendants of the Vascones, but the similarity of two foreign designations of a people is unsafe ground for a theory, besides which, nothing is known of the origin of the Vascones. All that is known is that they have occupied the same territory from remote times, and speak a language, of whose history we are ignorant.

Asia is of great ethnological interest as the historical cradle of the human family, and to which, as a centre, modern science traces the origin of the Shemitic, Aryan, and Turanian families of languages. The tracing of the languages means the tracing of the peoples who speak those languages. The Aryan race, originally Asiatic, colonized Europe, and with the exception of the Finn family and the Basques, have long constituted its population. But the Aryan race spread eastward as well as westward, and colonized both Persia and India. The Aryan languages were called the Indo-Germanic languages, to designate the large area over which they were spoken, namely, from the mouth of the Ganges in the east to and including Germany in the west. When Dr. Prichard, in the year 1831, proved the Celtic languages to belong to the same family, the geographical name was changed to Indo-European. The term Aryan is an ethnic name, and is also adopted to name the lingual family. It will be convenient to treat of the Aryan race in Asia before the other races.

The Aryan Race in Asia.—The Sanskrit language is a highly-cultivated one, and as Mr. Colebrooke states, 'It evidently derives its origin from a primeval tongue, which was gradually refined in various climates, and became Sanskrit in India, Pahlavi in Persia, and Greek on the shores of the Mediterranean.' The Sanskrit is now a dead language, but it has descendants both direct and collateral still spoken in India, which bear the same relation to it that Italian and Spanish bear to the Latin. And the people who spoke the Sanskrit are represented by the peoples speaking these derived languages. The holy land of the Brahmans, called by them Aryavarta, is the land lying between the Himalaya and Vindhya Mountains, whence they spread themselves over the greater part of India. They came in contact with peoples already in occupation of the land, and the notices of these peoples in the Vedas is much like the Scandinavian notices in the Sagas of the Finns and Lapps, with whom the Gothic settlers came in contact. The people of Hindustan, or Northern India, as stated by Mr. Prinsep, speak languages derived from the Sanskrit; but this cannot be said of the languages of the Deccan, for they are entirely distinct in origin, although they contain many Sanskrit words belonging to religion and Sanskritic civilization.

The first invasion of the Deccan by the sovereigns of Northern India was about fourteen centuries before the Christian era. The word Deccan or Dekhan, applied to name the peninsula, is the Sanskrit *Dakshin*, and simply means south. The Hindus were powerful in North India for centuries before the confederated monarchs invaded the Deccan. Rama, king of Oude, whose story in the Ramayana is so full of interest, is one of the earliest names of Hindu heroes. Previous to this date the history of India appears to be mixed with fable. At this date we find Northern India peopled by the Sanskritic race, and consisting of monarchies, with all the machinery of state for confederated action against alien races.

All the people of India who speak languages essentially allied to the Sanskrit are, in an ethnological sense, Hindus. And they belong to the Aryan race, that race to which we and the bulk of Europeans belong. The area occupied by the Hindus is bounded on the west by the Indus, on the east by the delta of the Brahmaputra, on the north by the Himalayan countries, and on the south by the Vindhya Mountains. The Hindus are of middle stature, rather small foreheads, and of thinner and more meagre faces than Europeans. Their features are regular, with a copper-coloured complexion; but there is considerable variety of complexion. The Brahmans and upper classes, who are less exposed to the sun and climate, are much lighter than the peasantry, as are those in the north, and those dwelling on elevated table-lands and hills. Some Brahmans, however, are dark, approaching to the black of Negroes, and some of the Pariahs are of very light complexion. These instances, however, are not common, and are deemed to be portentous, for the proverb says, 'Never trust a black Brahman, or a white Pariah.' The higher orders of the Hindus, especially in the northern provinces, are handsome men, with oval faces, aquiline noses, and well-built. Many of the Bengal regiments consisted of handsome well-made men, above the middle stature, and of regular features. They were the elite of the Indian army both in physical characters and intelligence. The details of the ethnology of the Aryan race in India would fill a volume. There are other peoples in Asia which belong to the Aryan race, and we proceed to the Persians.

The Persians and the Medes suddenly appear during the sixth century B.C. on the theatre of human affairs, and soon after take the place of masters of the world. They were previously unknown to Europe and the west of Asia. But they were foreknown to the Hebrew prophets. This race came with the power of Europeans, and in Darius and Cyrus may be recognized Aryan energy far greater than in the Chaldean rulers of Mesopotamia. Whence came the peoples of the Aryan race so well known in after ages as the Hindus of Hindustan, and the Persians of Persia? The Aryan race of Europe came from the east, from Asia; the locality is unknown, but doubtless it was Western Asia. Was their origin Western Asia, or was that only a temporary abode, as Bohemia was of the Celts during their movement westwards? At the dawn of European history the several peoples of the Aryan family occupied, generally at least, the same position rela-

tively to each other as they do now, so that the colonization of Europe took place in pre-historic times. In like manner the Hindus, at the dawn of Indian history, are found in Hindustan, and the Persians in Persia. The Aryans, therefore, of India and Persia left their native seat, and colonized those countries in pre-historic times. Herodotus states that the Persians were long subject to the Assyrians, for whom he claims a higher antiquity. Darius, in the Behistun inscription, calls himself a Persian, 'the son of a Persian, and of the royal family of the Achæmenidæ. Eight of my family have reigned before me, and I am the ninth.' But who preceded the Achæmenian dynasty? Herodotus does not carry his readers to the founder of this dynasty, but oriental historians describe this as a restored dynasty, which had reigned over Iran (the ancient name of Persia) for centuries in splendour, and with martial magnificence.

The proper name of the ancient Medes, as given by Herodotus, is Ἄριοι, that is *Aryans*, and Strabo states the Aryan country to extend in the east to the Indus. He says the Aryans include the Persians and Medes, as well as the northern Bactrians and Sogdians, and he adds the important statement, *that all these nations spoke dialects of one language.* Media was the country of the Zend language, and the Zend is the ancient basis of the modern Persian dialects. In the writings of Zoroaster these nations are spoken of as one people, the people of Ormuzd, and both the country and people, in the Zendavesta, are called Aria. Darius, the son of Hystaspes, some of whose military exploits are recorded in the Behistun inscription, was a worshipper of Ormuzd, to whose power, exerted in his behalf, he attributed his successes. The Persians are well known as a remarkably handsome people, with regular features, long oval faces, black, long, and well-marked eyebrows, and large black eyes, which they compare to the eyes of the gazelle, and which is esteemed to be the greatest element of beauty. The Parsees of Surat and Bombay are descendants of the ancient Persians, whose religion they continue to practise, are very handsome, and may be described in like words. There are Parsee merchants in London to whom the description most strictly applies. (Pl. LXIV. fig. 3.) There are several peoples which do not belong to the present Persian nation, although mostly on its frontiers, but which are within the boundaries of the ancient Iran, as the Afghans, the Kurds, the Baluchi, the Haikani or Armenians, and the Ossetines.

The Afghans.—This is their Persian name, they call themselves Pushtaneh, and are called by the Indians Patans. Their language they call Pushtoo, which is descended from the Zend, and therefore an Aryan language. The Afghans are a fine handsome race of robust build, strong and active. They have long faces, high noses, with black, brown, or red hair, and some have blue eyes. The eastern Afghans are of darker complexion than the western, many of whom are as fair as Europeans. Mr. Elphinstone describes one tribe as being remarkable for their fair complexions, gray eyes, and red beards, and as above the ordinary stature.

The Kurds.—Kurdistan is the home of the Kurds. The language is a dialect of the Persian, but each Kurdish tribe seems to have its own dialect. The people are strong, broad-shouldered, with dark complexion, black hair and eyes.

The Baluchi.—The Baluchi are a pastoral people, living in tents and nomadic. They are Persians, and speak a Persian dialect.

The Armenians.—They call themselves Haïkani, and their country Haïkia, which is of large extent. The language belongs to the Aryan family, and is of the Zend branch. The people are handsome, the men tall and well proportioned, and both sexes have regular features, and are fair.

The Ossetines.—They dwell on a part of the Caucasian chain of mountains, and are described as a predatory and barbarous people. The language is Aryan.

The area occupied by the Aryan race in Asia is much larger than it is commonly estimated to be, and it is continuous from near the eastern shore of the Black Sea to the mouths of the Ganges. Dr. Prichard's ethnographical map of Asia well exhibits that magnitude. The Aryans of Asia, like those of Europe, have no records of their origin, nor of their migrations, nor of their first settlements in this large area. The ancient ethnological chart, Gen. x., shows that the second cradle of the human race was in Western Asia, and Ararat, which is Armenia (see Isaiah xxxvii. xxxviii., compared with Gen. viii. 4), is the country containing the mountains on which the ark rested. This view was held by the translators of the Septuagint version of the Hebrew Bible, by Josephus, and by ancient authors generally. From Armenia, then, which is sufficiently precise, as a centre, the descendants of Noah spread themselves in various directions. The descendants of Japheth, known to us as constituting the Aryan race, spread themselves westward, and became European Aryans, and also spread themselves eastward, and became Asiatic Aryans.

The Deccan.—The principal languages of the Deccan are the Tamil, Telugu, Malayalim, and Canarese. These are collectively called the Dravidian languages, from Dravira, the ancient name of the region. These are descendants of an ancient language, of course unknown, but unconnected with the Sanskrit. The Aryan race gradually extended into the Deccan, less probably by conquest than by the introduction of the Brahmanic religion, and superior social institutions of the Hindus. The Sanskritic element of these Dravidian languages consists almost entirely of the vocabulary of the religion and the municipal institutions of the Brahmans. The bulk of the languages remain intact, both in grammar and vocabulary. The Tamil is a literary language, with poetry and history deserving of study. Rask, the distinguished philologist, deems the Dravidian languages to be allied to the Finn family of languages, and believes that ancestral languages of the Dravidian and Finn families, in most remote times, were spoken over the continuous area from Cape Comorin in India to the North Cape in Europe; and that this language was displaced by the Aryan languages both in Europe and Asia. It must be admitted that the Gothic Aryans came upon a race in the north of Europe, already in the occupation of a part of the southern shores of the Baltic and all Scandinavia; that the Slavonian Aryans came upon the same race already in occupation of what is now Russia; and that the Hindu Aryans came upon a race already in occupation of the Deccan, a race deemed to be of the Finn family. The consideration of these facts may well justify us in undertaking a more laborious investigation of the Dravidian and Finn languages, and that with a view to show what the languages must have been to yield such forms as now exist.

Mountain Tribes.—The mountain tribes of India, both of Hindustan and the Deccan, are both rude and barbarous. They have been closely studied, but much still remains to be done before it is safe to speak affirmatively of their ethnology. The evidence is enough to speak negatively as to the Aryan race; they are not Aryans. It is conjectured that the mountain tribes of Hindustan belong to the Tamulian people of the Deccan, who were either driven or retired into

the mountains on the occupation of the country by the Aryans. But the evidence is not yet conclusive to establish that view. Their mutual relationships are yet unknown, as are their relationship to the Tamulians. But what of the mountain tribes of the Deccan? Those of the northern mountains of the Deccan, as the Gonds, are described as similar in manners, customs, and language to the Bhils of Hindustan, which indicates some connection between them, but too little is known to form very decided opinions concerning them. The mountaineers of the Nilgiri Hills, in the south of the Deccan, are perhaps the most interesting study for the ethnologist of India. They consist of four tribes, the Tudas, Baudagurs, Carumbars, and Kothurs. The Tudas are a manly and noble race, their visages present all the features of the Roman countenance finely and strongly marked; their tall and athletic figures form a contrast to the people of the plains, and many are upwards of 6 feet high. All travellers speak of their Roman noses and open countenances. Mr. Buckingham described the children to be as fair as those of Derbyshire, and the women with feminine characters, but finely grown and handsome as the men. The language is unwritten, but appears to be an uncultivated dialect of the Tamil. The other three tribes, although of the mountain, yet dwell on the lower flanks, between 1000 and 2000 feet only above the sea level. The Tudas are said to be the aborigines, and the others mere colonists. In the case of the Tudas, dwelling at a considerable height above the sea, the ethnologist sees that elevation near the equator can give a climate equal to a latitude of 40° or 50° with a like result on the inhabitants.

The mountain tribes of Hindustan and the Deccan are very numerous; their distinguishing names are often those of the districts in which they are found, and tribes of the same people are found under different names. It is quite impossible in a sketch like the present to give even a catalogue of their names and dwellings. In an able paper by General Briggs, of the Madras army, he adduces evidence, both physiological and philological, to show that all these mountaineers are of Tamulian origin.

The physical characters of the Tamulian race have been well described by Mr. Logan of Singapore, and his description applies to those in the north of Ceylon as well as to those of the Deccan. He says mixed features abound in India, and the variety in the Deccan is so great as to be evidence of much mixture, of which, however, there are prevalent characters, neither Aryan nor Tibetan, and even distinct from Ultra-Indian, that is, Indian beyond the Ganges. The distinctive features are—a pointed and frequently hooked pyramidal nose, with conspicuous nostrils, longer than round, with a defined orbital ridge, brilliant but smallish eyes, large mouths and thick lips, the lateral expansion of the jaw greater than the Aryan but less than the Turanian, which gives a marked breadth to the middle of the face, so that the oval form bulges at the sides. The forehead recedes, the head is rather low and less than the Aryan. They have fine hair, which is straight, good beards and very dark complexion, often approaching to black. They are below our middle stature.

The Mongolian Race.—The extent of area in Asia occupied by this race can be easily seen by drawing a line on a map of Asia from the eastern end of the Black Sea through the Caucasus, across the Caspian Sea, thence along the river Oxus, nearly to its source, thence curving south-east, following the Himalaya Mountains to the Bay of Bengal. The area north and east of this line is that of the Mongolian race. It was called *Turan* by the Persians, that is, the land of darkness, in contrast to *Iran* (Persia), the land of light. The Mongolians and the people in the north-east of Europe were called by the Greeks Scythians.

The term Mongolian does not mean, as has been supposed, that the race originated in Mongolia, but only that the physical characters of the race are prominently displayed in the Mongolians. In this large area, however much the peoples may differ in language, habits of life, and social character, they are very similar in physiognomy, complexion, and build. Wide cheek-bones and oblique eyes are constant characters of the race. The cause of the oblique eye, as it is called, is not popularly known. The eye itself is not oblique, for it is placed and maintained in its cavity by muscles precisely like other eyes. The obliquity is in the eyelids, the angles of which are not in the same horizontal line, the outer angle being higher than the inner one. This eye is well illustrated in the Kalmuk woman, Pl. LXI. fig. 2. It occurs in a less degree in the Chinese mandarin, fig. 3, in the same plate. The eyebrows may or may not be parallel with the line formed by the closure of the eyelids. In the Kalmuk woman they are parallel, but in the Samoied (fig. 6) and in the Norwegian Lapp (fig. 8), both in the same plate, they are not parallel. The Mongolians and the peoples of Great Tartary are of a tawny complexion, with scanty hair on their faces, and the Tungusians pluck out the little that grows there. The hair of the head is black or dark-brown, long and lank.

The Samoieds and other Siberian tribes, both fixed and nomad, belong to this race. The Tartar features affiliate them. This race extends westward across the Uralian Mountains, and comprehends the Vogulians, Lapps, Finns, and allied peoples. The Hungarians belong to this race, being Vogulians who made their way south about a thousand years ago, and settled in what is now called Hungary. They have lost much of the Mongolian character, as is seen in Pl. LXI. fig. 7.

The Turk Race.—This is a Mongolian race, and the language belongs to the Tartar family. The Osmanli Turks of Turkey are not pure Turks, or Uigurs, although they are descended from them. Turkish tribes are found on the river Lena, in Siberia, who physically resemble the Ostjaks and Lapps, but speak Turkish, and would be understood at Constantinople. The Osmanli Turks, by climate and mixture with other peoples, have lost much of the Mongolian character, as may be seen in Pl. LXI. fig. 9. The history and minute ethnology of the Turk race are subjects of great interest in connection with the great Mongolian Empire, with Genghis Khan, with the Chinese, with the Thibetans, and their inroads in Eastern Europe.

The Chinese.—The Chinese and Indo-Chinese peoples are of the Mongolian race, as are the Koreans and Japanese. The earliest notice of China is found in the book of Isaiah: 'Behold, these shall come from far: and, lo, these from the north and from the west: and these from the land of Sinim' (xlix. 12). Sinim is China. Isaiah lived about 700 years before Christ, and about a century before Confucius. Professor Neumann states that all the varieties of language spoken in China are merely dialects of one language. There is considerable difference in the physical characters of the Chinese, and the higher classes compare well with the labouring classes; yet they are all obviously Mongolians. (Pl. LXI. fig. 3.)

The Chinese type of man is found over a large area from the eastern slopes of the Himalayas eastward to the ocean. All the peoples to the south of China, indeed all of Trans-Gangetic India, except the Malays of Malacca, are Mongolian peoples, and allied to the Chinese by speaking monosyllabic languages

The Thibetans are Mongolians, and the priest of Buddha figured in Pl. LXI. fig. 5 exhibits the usual characters of the race. The people of Bhutan and Thibet are remarkable as being the great authorities of Buddhism, and the Grand Lama resides in Thibet, surrounded by his hierarchy. The language of Thibet and Bhutan belongs to the Tartar class, with Turk affinities, and is written in a character derived from the Deva-nagari, as the Sanskrit alphabet is called.

The Japanese.—This is a fine race, of middle stature, stout, not fat, well made, active and free in their movements. Their heads are full-sized, hair long, black, and thick, and their nose rather thick and short. They have the Mongolian eyelids. The complexion is copper-coloured, but in the upper classes, who are less exposed to the weather, the complexion is fair. The language is not monosyllabic. It is Mongolian. The Japanese who have visited England are very intelligent and ready to adopt European institutions. (Pl. LXI. fig 1.)

The Esquimaux.—This is a well-known and widespread race, occupying territory on the Frozen Ocean, from Behring's Straits to East Greenland. Over this area several dialects are spoken, but they are merely varieties of one speech. This language is one of the great family of American languages, and is intimately connected with certain dialects spoken in the northwest of North America, and also with those of the Aleutian Islands. The Esquimaux language, then, is traced across the straits on the western side of North America, to the eastern coast of Northern Asia. And philologists have shown that some Indian dialects in the north-west of America, as those in the neighbourhood of Nootka Sound and Unalaska, are related to Mongolian dialects spoken by Mongolians in Eastern Asia, which is lingual evidence that America was peopled from Asia. A connection has also been traced between the Esquimaux language and the ancient language of Mexico. The Esquimaux seldom reach 5 feet in stature, but are well proportioned, with broad and flat faces, high cheek-bones and plump cheeks. Their eyes are rather small, their nose is neither so prominent as the Indians, nor is it spread. They have black, strong, straight, and long hair. (Pl. LXI. fig. 4.)

The Shemitic Race.—An extensive region of Western Asia, between the shores of the Mediterranean and the plateau of Iran, has been from the time of Abraham the home of numerous tribes of people, which have been designated the Shemitic race. The term is not quite accurate, but its general adoption to designate both the group of languages and peoples shows that the term is convenient. The Syrians, Hebrews, Arabians, Assyrians, Babylonians and Phœnicians, that is, the Canaanites of the Bible, are members of this family.

The Canaanites and Hebrews.—The Canaanites are said to have been Arabians who colonized Canaan. When Abraham left Ur of the Chaldees he migrated to Canaan, which was a settled country of Canaanites, so that they must have emigrated and possessed the country in prehistoric times. The Canaanites gradually formed trading settlements on the coasts of the Mediteranean, both the north and south coasts.

Abraham emigrated from Ur, and his son Isaac appears to have adopted the language of Canaan, but his son Jacob certainly did (see Gen. xxxi. 47). The Hebrew language is called by Isaiah 'the language of Canaan' (chap. xix. 18). And a careful study of the Phœnician inscriptions induced Gesenius to state the two languages to be the same. The longer and more important inscriptions discovered since the death of Gesenius all proclaim the same fact. The Jews have assimilated in physical characters to the nations amongst whom they have long dwelt, yet they preserve the Hebrew physiognomy. In the north of Europe they are of fair complexion. Blue eyes and flaxen hair occur in English Jews, and their red beards are common in some parts of Germany. The Jews of Portugal are dark. The Jews of Cochin and Malabar are nearly black, and those of Honan in China cannot be distinguished by complexion from the Chinese. Jews are not allowed to intermarry with Gentiles, and they still pride themseves in being a distinct people, so that this assimilation cannot be attributed to intermarriage with the several peoples amongst whom they have so long dwelt.

The Syrians, Assyrians, and Babylonians.—Sir Isaac Newton affirmed in his chronology of ancient empires, that the Babylonians were Shemites. Gesenius that they were Medo-Persians. Modern researches, by means of the cuneiform inscriptions, incontestably prove them to have been Shemites. But before the Shemites occupied Babylonia there was a population who spoke a language called Akkadian, which was not Medo-Persian, but allied to the Scythian, and from this people the Shemitic Babylonians certainly adopted a part of their religion and pantheon. This religion was adopted also by the Assyrians, the Syrians, and the Phœnicians or Canaanites. The physical characters of these peoples are well represented in the Assyrian sculptures, where they are represented as tall, well-built people, with fine heads, large foreheads, regular features, full eyes, countenance in general like the Portuguese Jews, and probably of the same complexion, with abundance of hair on the head and face, which they carefully dressed. (See Lev. xix. 27; 2 Sam. xix. 24; Cant. v. 11.) The complexion of the Hebrew women was lighter than that of the Egyptians (Cant. i. 6).

The Arabs.—The Arabs of Arabia are a fine race, above the ordinary stature, well formed, robust and active, with oval faces and copper-coloured complexions; but considerable differences are found amongst them, those in the south being darker than in the northern part of Arabia and on the mountainous parts, where the people are fair, with red hair and blue eyes. The Arabs, like the Jews, are proud of their genealogies, and the Assyrians were so also, so that it is probably a feature of the Shemitic race. This character is also shown by the Bedouin Arabs, who dwell in tents and wander in the desert.

Africa.—*The Ethiopian Race.*—The term Ethiopian, from the Greek *Aithiops*, which, as an adjective, means sun-burned, swarthy, is loosely adopted to name the dark-brown and black people of Africa. Abyssinia is a part of ancient Ethiopia. Kush was a son of Ham (Gen. x. 6), and Kush is the Hebrew name of Ethiopia, both of that in Arabia as well as that in Africa. There appears to have been a Kush near Susiana, which is identified as Kutha (2 Kings xvii. 24) in Assyria. The Queen of Sheba, who visited Solomon (1 Kings x. 1), reigned over a Kushite people in South Arabia. And Candace, queen of the Ethiopians (Acts viii. 27), ruled over a Kushite, probably the same people. The Ethiopians of Arabia are most probably the ancestors of those of Africa. But however interesting they may be, the subject of highest interest in African ethnology is the Egyptian race.

The Egyptian Race.—Various opinions have been held on the origin and consequent affiliation of the ancient Egyptians. The mummies supply evidence of an indisputable character of the physical characters of the ancient people of the country, and the paintings and sculptures agree with the mummies. The discovery of the language of the hieroglyphics too enables the philologist to study its affinities, so that sufficient evidence exists to discuss the ethno-

logy of this ancient race. The ancient Egyptians were about the middle stature, rather above it, dark complexion, from cinnamon colour to dark brown, dark, nearly black hair, with dark bright eyes. The women of the higher order were lighter than their attendant servants, but their hair was equally dark. Dr. Prichard says, if we had no other data than the descriptions of the Egyptians made by the Greeks, we should conclude that they were Negroes. Their hair, however, was not curly nor woolly. Some of the more ancient sculptures represent them with thick lips and somewhat protruding, yet not like the Negroes of the Gold Coast of Africa. The country now called Nubia, and anciently Ethiopia, was coeval with Egypt under the Pharaohs, and was the cradle of the Egyptian arts and civilization. The Egyptians and Ethiopians were kindred peoples, or branches of an ancient stock—the Mizraim and Kush of Gen. x. 6—the language of the great ancestor being modified in the two lines of descent until two apparently quite distinct languages appear, which yet bear traits of likeness, especially in the pronouns. The old Egyptian language of the Pharaohs is represented by the Coptic, its descendant, now long extinct, although the liturgy of the Coptic Church is still read in it. The present Copts are described as tall, well made, a full countenance, a long aperture of the eyelids, projecting cheek-bones, dilated nostrils, thick lips, with black and crisp hair and beards. They are very superior to the Arab population. M. Denon was much struck with the great resemblance of the Copts to the sculptured likenesses of the ancient Egyptians. And Mr. Ledyard deems the Copts to be the ancestors of the Negro race. The Nubians are the descendants of the ancient Ethiopians, and as in former times the Ethiopians and Egyptians were physically much alike, so their descendants the Nubians and Copts retain much of that likeness. (Pl. LXIII. fig. 3, and fig. 1.)

The Shemitic Race in Africa.—Shemites spread into Africa in very early times. Manetho describes the invasion of Egypt by Arabian shepherds, who long ruled the country, and whose final departure he connects with the exodus of the Israelites. Kushites (Ethiopians) of Arabia passed into Africa, where they established an African Kush (Ethiopia), and became a powerful people. The twentieth dynasty of Egypt was Ethiopian, and Tirhakah (2 Kings xix. 9) was the last king of the dynasty. The Nubians of the Nile call themselves Berberines, or Barabra; they spread themselves westward, and occupied the North of Africa from the Sahara to the Mediterranean Sea. The Canaanites at an early period colonized the African, as well as the European shore of the Mediterranean, and Carthage, now Tunis, rivalled Rome itself. And the extent of the Mohammedan conquest and Arab settlements is well known. From this brief statement it is evident that the descendants of Ham and Shem are the largest and most important part of the population of Africa, and there is ground for speaking of the Africans generally as the Ethiopic race; but it is also true, that we yet know but little of Central Africa and its peoples.

A broad belt of country on each side of the equator is inhabited by a black population called Negroes. They consist of many tribes, nations, and peoples, each group with its own name, but all are Negroes. Other populations have been called Negroes, but as Ptolemy long ago pointed out the true area of the Negroes is in the tropics. The black complexion and the crisp hair, the projecting jaw, are at their maximum in the equatorial region, and these physical characters gradually diminish in receding either to the north or south of it.

The Mandingos.—They are black with woolly hair, with thick lips, but fine open countenances and mild manners. They cultivate the land and carry on an extensive commerce. They are industrious and thrifty. They have public schools, and industriously teach the Koran, so that the majority of the people can read. As true Mohammedans they abhor pigs, but have abundance of domestic animals. (Pl. LXIII. fig. 4.)

The Yolloffs.—These Negroes are tall, well made, with features regular as Europeans, nose not much depressed nor spread out, complexion approaching black, with black woolly hair. Mr. Golberry says they are remarkably handsome, and the women beautiful. They are remarkably cheerful, but indolent. (Pl. LXIII. fig. 9.)

The Bambarras.—These people are allied to the Mandingos, but have not yet emerged from barbarism. They are black with woolly crisp hair. Their heads are round, countenance dull, flat noses, thick lips, projecting jaws and wide cheek-bones. They are gay and good-tempered. (Pl. LXIII. fig. 5.)

The Ashantees.—These people belong to the great Inta race of the Gold Coast, which includes the Fantees and other tribes speaking dialects of a common language. The men are well made, less muscular than the Fantees. The women in many instances are handsome, and Mr. Bowdich states many of the upper class have *regular Grecian features*, with brilliant eyes. He adds, they appear to be Indian rather than African. (Pl. LXIII. fig. 6.)

The Acras.—The Acra people are different in physical characters from the Inta race, by whom they are surrounded. They are Negroes, of a good stature, well made, and many of them, except from their black complexion, would be considered beautiful. Their customs are peculiar: they practise circumcision—*utriusque sexûs*—which elsewhere in these countries is unknown. Their hair is woolly, curled, and black, but sometimes red.

The Hottentots and Kafirs.—The southern region of Africa is peopled by tribes belonging to two woolly-haired races, differing in some respects from each other, and also from the Negroes, yet having some characters in common. The Hottentots belong to the western side of Africa, and the Kafirs to the eastern.

The Hottentots.—The origin of the name Hottentot is still unknown. They came originally from the north of Africa, and made their way south by the western side. The names of rivers and localities north of their present abode are Hottentot and not Bechuana words. Vater considered them to be an early people pressed southward by a secondary tribe, and that by another, and so on, just as the Celts were pressed on by successive waves of population of the Aryan race. The late Mr. Norris, one of the greatest linguists and soundest philologists, after a careful examination of the Rev. Mr. Schmelen's version of the Gospels in the Namaqua dialect of the Hottentot language, states its affinities to be Coptic and Shemitic. The writer of this article verified the statement, and cannot resist the evidence that the Hottentot language is in affinity with the Coptic, or with the Old Egyptian, the ancestral language of the Coptic. This lingual connection is as important as it is unexpected. The Hottentots are well proportioned, erect, of delicate and rather effeminate build, with rather small joints and extremities. The nose, though generally flat, is in many cases raised. The eyes are of a deep chestnut colour, long, and narrow opening of the eyelids. The complexion is copper-colour, with dark woolly hair.

The Bushmen.—These were formerly deemed to be a race of men distinct from the Hottentots and Kafirs, but they have been proved to be outcasts of

the Hottentots. A careful study of their language shows it to be Hottentot, but still more degraded than that. They live an exposed life, suffer great hardship, and are treated as enemies by the Hottentots. They are short of stature, copper-coloured in complexion, and much like the Hottentots (Pl. LXIII. fig. 7).

The Kafirs—The Kafirs, or Caffres, have been confounded with both Hottentots and Negroes, yet they are obviously distinct in external form and complexion. They are tall, well made, muscular, and well proportioned in their limbs. Their complexion is a rich brown, with black woolly hair. The forehead is high, and the nose prominent like a European's. The lips are thick, the cheek-bones high, and abundance of beard. The Kafirs in the north of Kafirland, towards the equator, approach in some respects to the Negro type, but all the rest bear a great resemblance to Europeans. (Pl. LXIII. fig. 8.) The Kafir tribes are numerous, and the tribal names being variously written by different authors, it is sometimes difficult to identify them; thus the Zulu tribe is written Zoolah and Amazúlúh. The Kafir, like the Coptic language, inflects its words by prefixes. Ample materials exist for a lingual map of Africa, so far as its peoples are known, and such a map would display the large area over which the Kafir and its allied languages are spoken. The Arabic word *Kafir* means infidel, and was first applied to the natives of Mozambique by the Arabian settlers.

The Barabra Race.—Lepsius describes the Barabras of Korusko as an intelligent and honest race of peaceable but not of slavish disposition, of handsome stature, with shining, reddish-brown skin, and all travellers represent them to be like the pictures of the old Egyptians. Their hair is not woolly, but long and slightly crisp. In adults it is black, but in children it is mixed with light hair, but appears 'as if it were reddened by fire.'

The Berber Race of the north of Africa occupy the elevated regions, whence the country was formerly called Barbary. The Mohammedan invasion drove them from the coast to the hills, where they are now found. They are of middle stature, with brown complexions, black but not woolly hair. They are industrious and peaceable. This race extended itself to the Canary Islands, being there known as Guanches, and their mummied remains have attracted much attention, the manner of their interment resembling that of Egyptian mummies. The Berber language is Shemitic, and appears to be a degraded Ethiopic; but the people cannot understand Arabic, which is spoken in Tunis and along the coast.

Oceanica.—*The Malay Race.*—Malacca is commonly stated to be the continental home of the Malay race, whence they spread themselves over the vast area which they occupy. It will be convenient to consider them under three classes:—

1st. *The Indo-Malays.* These are the people of the Indian Archipelago, natives of Borneo, Java, and other islands of that region. They are essentially a maritime people, and from their roving predatory habits have been called '*the Arabs of the Sea.*' They are of short stature, slender build, with small limbs, flat faces, and features resembling the Chinese. They are fairer than the Hindus of Southern India, but darker than the Chinese. Their eyes are dark, and hair long, black, and glossy. Their noses rather flat, and cheek-bones rather prominent. Some of the physical characters vary, as might be expected in so large an area; thus the yellow cast of the complexion in Borneo passes into copper-colour, and in Java hair of a deep reddish-brown is common. The Dyaks of Borneo very well represent this class of Malays. (Pl. LXII. fig. 3.)

2d. *The Polynesians.*—This branch of the Malays occupies the groups of islands of the Pacific Ocean. The vast area of ocean studded with islands can only be apprehended by a map of the ocean. The New Zealander may be taken as a type of the race—they call themselves *Maori*, that is, Natives. The languages of all these nations are dialects of one common speech. They are of middle stature, many are tall, complexion varied from an olive tawny to a very dark olive. Their faces are oval, their lips thick, noses not flat nor yet aquiline, but stand well out at the lower part. Their eyes are large and lustrous. They have long, straight, black hair, but dark brown hair is often found. Admiral Fitzroy states the complexion to be 'dark coppery brown.' It is a fine race, both physically and mentally. (Pl. LXII. fig. 7. The Marquesian Islanders are well represented in fig. 2.)

3d. *The Madagascar People.*—They are called Malecasses or Madecasses, the *d* and *l* being interchangeable. Their origin has been much discussed, but a comparison of their language with the Tagala, the Sanskrit of the Malay languages, spoken in the Philippine Islands, shows an unmistakable affinity, and therefore proves them to be Malays.

The Papua Races.—New Guinea was so called from its being inhabited by a black people resembling in some respects the Negroes of Guinea in West Africa. They are called Papuas, and are spread over a large area. They have bushy, frizzled hair, which grows in separate tufts. Their stature, as those of the Nicobar and Andaman Islands, is short, and in general the complexion is not a glossy black, like the African Negroes, but a sooty colour. The physiognomy is not African, and when the complexion is not black it is dark olive brown. The Papuas of New Guinea, which some consider to be the home of the race, are of middle height, strong, active, well built, and of blackish complexion. The hair growing in tufts each hair has a spiral twist, like a cork-screw, and is often a foot long. The countenance is not disfigured by a projecting jaw, but the lips are thick. The nose is not flat, like the African Negro, but is rather spread out at the nostrils. The head is broad, the eyes are dark and bright. (Pl. LXII. fig. 1.)

Many of the Polynesian Islands are inhabited entirely by the Papuan race, and they have been grouped together and called Kelænonesia, from Greek *kelainos*, black. In New Zealand and nearly throughout Polynesia there is a black population co-existing with the true Polynesians. They are inferior to them, and are so treated. The Polynesians, like the Brahmans of India, are fond of caste, and the Papuans have no distinction of caste. The New Zealanders deem the Australians to be Papuans, and treat them with contempt. The Papuans always speak the Polynesian language of their fellow-islanders, and that without a trace of any other language. The languages of Kelænonesia have not been studied sufficiently to determine their affinities, but the late Mr. Norris proved that of the Fiji Islands to belong to the Polynesian class, and consequently to be a Malay language.

The Australians.—The long black silky hair of the Australians is like that of the Malays. The languages of Australia appear to be merely dialects of one common speech. They are rather above the middle height, slender, with long arms and legs, indeed they are thin, not robust nor strong, yet rather fleet in running. Their heads are average size, foreheads narrow, eyes small, black, and deep set, the nose depressed between the eyes and spread out at the lower part. The cheek-bones are high, the mouth large, the chin rather retreats, and the neck is short. The complexion varies, in some it is a chocolate

colour, in others sooty black, and others are as light as mulattoes. Their most striking character is their hair, which Mr. Wilkes describes as like that of dark-haired Europeans, but more silky in texture.

AMERICA.—*The American Races.* Some writers consider the native races of America to have an origin entirely distinct from those of the old world. Others deem them to be of the Malay race, while others describe them as Mongolians. It will be convenient to describe them geographically, as peoples of North, Central, and South America, and then to add a few remarks on their origin. We have already treated of the Esquimaux.

North American Races.—The early settlers in America called the natives Indians, and also Red men, from their copper-coloured complexions. There is, however, a considerable variety of complexion amongst them. Mr. Catlin says, 'A stranger is at once struck in a Mandan village by the different shades of complexion and various colours of hair which he sees around him, and is almost disposed to exclaim, These are not Indians.' The Mandan tribe is now almost extinct from an epidemic of smallpox, but at the time of Mr. Catlin's visit they were a small tribe. The Mandan tradition of their origin has suggested the idea of their being descendants of Prince Madoc's Welsh army. It is quite true that they differ in many respects from the Sioux Indians, of whom they form a part, but there is no evidence of their Welsh origin.

The Missouri Indians are above the average stature of Europeans. They are well made, robust, and active, muscular, but not fat. They have aquiline noses, high cheek-bones, but little hair on the face, and bright eyes. Their gait is erect, they turn the toes inwards as they walk, to which they attribute their ability to walk without fatigue for 30 or even 40 miles a-day for several days in succession. The description of the Missouri Indians applies to the large Dahcota tribe and the Assiniboins, as well as to the other stems of the Sioux race. (Pl. LXII. fig. 5.)

A detailed description of all the tribes of North American Indians would fill many volumes, as is evident from the great work on the subject published by the Smithsonian Institution at Washington.

Central American Races.—The great race of Central America was the Mexican race, the Aztecs. The tragical conquest of this people and the fate of Montezuma is more like fiction than history. The Aztec race is either extinct or absorbed.

The Carib Race.—The Carib race consists of many tribes, of whose dialects upwards of forty have been described. The people are of middle height, strong, and active, of a dark-brown inclining towards tawny complexion. The eyes are black, the hair dark-brown. (Pl. LXII. fig. 4.)

South American Races.—The tribes of Indians in South America are less numerous than those of North America. The Guarani and allied tribes are scattered over nearly one-half the continent. They occupy their vast area in separate hordes, without any political connection with each other, and without acknowledging the authority of any common chief. The same language, with scarcely a dialectic variation, is spoken by them throughout that area, and yet very little intercourse is maintained even amongst neighbouring tribes. The Guarani are said to be 2 inches below the average height of Spaniards, square built, and ugly. They resemble other Indians in their eyes, aspect, and powers of the external senses. They are apathetic in appearance, of a sad, downcast expression, speak little, and that in a low tone. They do not complain nor cry, but they do not laugh. They are impassive. (Pl. LXII. fig. 6.)

The Patagonian Race.—They call themselves Tehuelhet, and there are allied tribes, as the Moluche, the Puelche, and others, all speaking dialects of a common language, which Captain Fitzroy states to be Chilian. They are a tall and stout race, with large heads and features, but small hands and feet. Their limbs are not so muscular nor large-boned as would be expected from their stature and bulk, and they are rounder and the muscles less conspicuous than those of white men. Their complexion is a rich reddish-brown, between the colour of rusty iron and clean copper, darker than copper, but not so dark as old mahogany wood. There is no tinge of yellow in them. (Pl. LXII. fig. 9.)

The ancient civilization of Mexico and of Peru, unconnected as they were, and probably unknown to each other, are wonders yet unexplained in the history of the native races of America. Other civilizations, as the Toltec, Mayan, &c., but less generally known, also existed in Central America. All these peoples were of the same race as the North American Indians. Some authors contend that some of the Indians abandoned the hunter's life, and civilizing themselves, founded the several states known to us in Mexico and on the Andes. The example of the nomadic Cherokees giving up their nomadic life, and becoming farmers, is appealed to as evidence of the ability of the Indians to civilize themselves, but it must be remembered that they were in contact with civilization and merely imitated what was before them. The social change from a tribal to a state life, from patriarchal rule to that of state offices and kingly rule, is so great, that it requires clear evidence before it can be accepted.

The source of the Mexican civilization is indicated by the following considerations:—

1. The language at Nootka Sound is connected with that of Mexico, as proved by Humboldt, Vater, and other philologists.

2. The *Casas Grandas*, as the ruins are called in the countries eastward of the Gulf of California, between the sea-coast and the highest ridges of the Cordillera, were erected by the Cora, whose language, according to Vater, is Mexican, both in grammar and vocabulary. Such ruins exist near the river Gila—ruins like those of Mexico in magnitude, style, and material.

3. The Mexican calendar was similar to that in use to this day in Eastern Asia amongst the Mongols, Manchus, and Tibetans, especially as regards their mode of grouping the years in cycles, which shows that at some remote period it was the common property of Eastern Asia and Western America.

4. Mongolia in ancient times was civilized, and continued to be so at the period of the travels of Marco Polo.

ETHYL is the name given to the radicle C_2H_5, which is contained in ordinary alcohol, and which forms a vast number of derivatives. It cannot, however, be isolated; for when the attempt is made it doubles and yields the substance C_4H_{10}, diethyl or butylic hydride. This compound can be prepared by a number of reactions, and it is also found occurring naturally in some kinds of petroleum. Diethyl is insoluble in water, but dissolves readily in alcohol. It is a colourless gas, which is liquefied by moderate cold and pressure, and which burns with a brilliant flame. It is not readily attacked by ordinary chemical reagents.

As to the compounds formed by the radicle ethyl they have been regarded in a variety of ways. Thus in its compounds with acids (ethylic ethers) it plays the part of a metal; in other compounds, such as those with nitrogen, it takes the place of hydrogen, while in its metallic compounds it seems to play the part of an acid. There is not at present, however, any

single view which embraces all the functions of such radicles, or which can distinguish them from those of other chemical substances.

ÉTIENNE, famous printers of this name. See STEPHENS.

ÉTIENNE, ST., a town of France, in the department of the Loire, on the Furens and crossed by two railways connecting it with Roanne and Lyons, 32 miles S.W. of Lyons. It is not regularly built, but has several spacious streets, one of them intersecting it almost centrally, and lined with rows of trees; but owing to the number of public works the whole place has a dingy appearance. The principal buildings and establishments are the cathedral, an ancient Romanesque structure; the town-house, courthouse, exchange, communal college, mining school, gallery of arts, library, and museum. The town owes its prosperity to its situation in the centre of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces, and other ironworks in its vicinity, has many important manufactures, including ribbons, and other flowered silks, hardware, cutlery, and firearms, the last made to such an extent as to have procured for St. Étienne the name of the French Birmingham. The ribbon manufacturers employ in their various branches about 28,000 workers. The hardware manufactures employ 7000 workmen; in the various processes of iron and steel manufacture about 9500 workmen are employed. The collieries are very extensive, and employ about 11,500 in the interior of the mines, and 4500 in exterior occupations. Pop. 96,620.

ETIOLATION, or blanching of plants, is a state produced by the absence of light, by which all green colour is excluded. It is effected artificially, as in the case of celery. The green colour of etiolated plants may be restored by exposure to light.

ETIQUETTE (French, a label). The origin of this word is much disputed, it being on the one hand referred to a Latin, on the other to a Flemish or a Celtic source. *Etiquette* is still used in French to designate the label attached to any package or vessel containing merchandise (as a bottle of wine) descriptive of its contents. Figuratively, it is applied to the formal ceremonies and usages of society. In this sense it has two distinct meanings. It applies first to the ceremonies of courts; and secondly, to the general forms of polite society. From the original sense of the word it may be inferred that it was formerly the custom to deliver cards containing orders for regulating the ceremonies on public occasions. Those countries in which etiquette among the higher orders has been most rigidly enforced have rarely been free and prosperous; and this artificial splendour, and external honour paid to the great, have, in general, been more anxiously exacted by them in proportion as real respect was wanting. When the Roman emperors surrounded themselves with imposing ceremonies they had long ceased to be the masters of the world; and the imperial court at Byzantium was never more observant of trifling and empty forms than when the provinces were in insurrection, and the barbarians swarmed under the walls of the capital. Philip the Good, duke of Burgundy, whose vanity prompted him to put himself on a level with his sovereign, is the father, as it were, of the modern system of etiquette, which has been introduced since his time, with more or less strictness, into many courts of Europe. To make himself equal in the eyes of the world to the first prince in Christendom he surrounded himself with a multitude of retainers and courtiers, and prescribed to them an etiquette so formal and minute, that the Spanish court alone (so lively and gay in the time of the Moors) surpassed it in strictness. Probably no nation has carried official etiquette to a greater degree of nicety and absurd formality than the Chinese.

Social etiquette consists in so many minute observances that a tolerable familiarity with it can be acquired only by a considerable intercourse with polite society. It is not, however, even with the necessary facilities, by any means an easy attainment. Many persons of respectable intelligence, and not otherwise destitute of good social qualities, wholly fail to become proficients in it. This may arise from either of two causes, the want of a sufficiently quiet and minute observation to catch all the details in which social etiquette consists; or the want of the innate tact, together with the requisite self-possession, to apply these details aright. It may perhaps be added, with due submission to the constituted authorities in such matters, that a good many things insisted upon in the so-called fashionable etiquette which commonly prevails in society, are, besides being very liable to fluctuation, of so little intrinsic value that it is very difficult for a man of fair understanding to become duly impressed with their importance; and they are therefore constantly liable to be transgressed by all but the most perfect habitués of social life.

It is often said that all that is necessary to constitute good social manners is common sense and good feeling; but this is not quite a fair statement of the case. Not only are there many difficulties in social intercourse which require tact and delicacy of judgment far beyond mere common sense; but the formal rules of society, even those which are intrinsically worthless, demand a certain amount of respect. Social etiquette is an art of considerable difficulty, proficiency in which confers considerable advantages, and it is consequently worth a good deal of study, especially to a young man entering on life, for its own sake as well as for the sake of the qualities it develops (in men not fops); but if any one finds that from temperament or any other cause he is unable to master it, his best course is not to sacrifice self-possession, a more valuable property, in attempting anything to which he feels himself unequal. Ladies, it may be observed in conclusion, are by nature and instinct proficient in etiquette, and are its best teachers. Jeffrey is said to have observed of one, that to have loved her was a polite education, and sometimes a courtship or a flirtation will give a man a tolerable initiation into the ways of polite society, when nothing else will serve the purpose.

ETIVE, LOCH, an inlet of the sea on the west coast of Scotland, county Argyle, district Lorn, nearly 20 miles long, of very unequal breadth, but at the broadest part about 1½ mile. It has a narrow entrance, and contains numerous creeks, which afford safe anchorage in all weathers. About 3 miles from the sea, where it is narrow, a ridge of sunken rocks crossing it causes a turbulent rapid, which at half tide forms a loud sounding cataract, believed to be the Lora of Ossian. The scenery of its shores is very beautiful.

ETNA. See ÆTNA.

ETOLIA. See ÆTOLIA.

ETON, a town of England, county of Buckingham, in a pleasant valley, on the left bank of the Thames, within ¾ mile of the Windsor station on the Great Western Railway, and 22 miles west of London. It consists principally of one narrow street, and has of late years been much improved. A neat iron bridge across the Thames connects Eton with Windsor, from which it is only separated by the river. Eton derives its celebrity wholly from its college, founded by Henry VI. in 1440, under the name of the College of the Blessed Virgin Mary beside Windsor. The present collegiate edifice, a conspicuous and ornamental Tudor building, was erected at

various periods; it contains, in two quadrangles, the chapel, the two schools, upper and lower; the masters' chambers, the provost's lodge, the private residences of the fellows, and the library. The scholars must be lawful children, born in England, and should be educated gratis, but ten guineas a year is charged for their instruction. They consist of collegers or scholars on the foundation, admissible from the age of twelve to sixteen, who are lodged and boarded in the institution; and oppidans or scholars, not on the foundation, who do not board in the institution, and are, in every respect, stipendiary pupils; of these last, the usual number in attendance is about 800. There are various foundation scholarships at Cambridge and Oxford, and also some exhibitions. At present the income is about £20,000 a year. The course of instruction is essentially classical, but of late years the study of French, German, Italian, mathematics, and other branches of education, have been introduced. Pop. 3261.

ETRURIA (Greek *Tyrrhenia*), the name anciently given to that part of Italy which corresponded nearly with the modern Tuscany, and was bounded W. by the Mediterranean, E. by the Apennines, N. by the river Magra, and S. by the Tiber. The name *Tuscia*, for the country, came into use in late times, while *Tusci*, as well as *Etrusci*, was used by the Romans as the appellation of the people from an early period. The country is covered by numerous chains of hills, partly offsets from the Apennines, partly independent ridges; and to these belongs the hilly and forest country in the south-east, known of old as the Ciminian Wood. Between the hills lie beautiful and fertile valleys, sometimes intersected by rivers, such as the Arno (ancient *Arnus*), sometimes containing lakes of volcanic origin, as Lake Trasimene (Trasimenus), near Perugia, and the *Lacus Vulsiniensis* (near Bolsena). The oldest inhabitants of the country belonged, according to the accounts of the ancients, to the Umbrian stock, and were dispossessed by the Tyrrhenians or Tyrseniana, a people who came by sea, and who were generally believed to be Lydians. These again were in early times subjected by another race who called themselves *Rasena*, and who finally became incorporated with the Tyrrhenians proper, the whole nation then being called Tuscans or Etruscans. These Rasena, by ancient writers usually confounded with the Tyrrhenians, entered Italy at a very early period from the north (Rhætia), and, gradually pressing southward, took possession of the whole country from the Alps, Ticino, and lower Adige on the north till beyond Bologna (in Etruscan *Felsina*) on the south. From Northern Italy they were driven by the Gauls; but in Etruria they founded a state powerful both by sea and land, extending their influence, partly through conquest, partly through colonization, far beyond the limits of Etruria, as, for instance, to Campania and the islands of Elba and Corsica. To what race the Etruscans belonged is unknown, and our ignorance is equally great with regard to their language, remains of which still exist in numerous inscriptions mostly on tombs. It appears to have been quite distinct from the languages of the rest of Italy, but attempts to connect it with the Greek, Celtic, Germanic, or Semitic languages have had little or no success. The characters used are essentially the ancient Greek, and were either introduced from Magna Græcia or possibly from Corinth. Etruria was very early a confederation under the rulers of the twelve principal cities, each of which formed a republic by itself. They were: Pisæ (*Pisa*), Pistoria (*Pistoja*), Florentia (*Florence*), Fæsulæ (*Fiesole*), Volaterræ (*Volterra*), Volsinii (*Bolsena*), Clusium (*Chiusi*), Arretium (*Arrezzo*), Cortona, Perusia (*Perugia*), Falerii (*Falari*), and the rich city of Veii. The chiefs of these republics were styled *lucumones*, who were also the priests and generals, and held their meetings in the temple of Voltumna, where they deliberated together on the general affairs of the country. Porsenna, celebrated in Roman history, was a lucumo. In all the cities there appears to have been an aristocracy, towards which the mass of the common people stood in the relation of clients, though there would no doubt be a body of entirely free men resembling the plebeians at Rome. The religion of the Etruscans offers a subject of great difficulty, but it is at least certain that it had many points in common with the religious systems of the Sabines and Latins, while in some respects it shows evidences of an eastern origin. 'There are not wanting indications which would connect the religious mythology of Etruria with that of the northern nations of Europe. The name of *Aesar*, which was the Etruscan appellation for the gods in general, at once recalls the *Asar* of the Scandinavians, and much of the gloomy worship of the infernal deities, which forms so prominent a part of the Etruscan religion, presents a strong similarity with the northern mythology.' Among the deities may be mentioned *Tina* or *Tinia*, corresponding to the Latin Jupiter, *Cupra*, corresponding to Juno, *Menerfa* (Minerva), *Sethlans* (Vulcan), *Turms* (Mercury), *Aplu* or *Apulu* (Apollo), *Voltumna*, *Vertumnus*, &c.

In the time of the later kings Rome was closely connected with Etruria (see PORSENNA and TARQUINIUS); in 485 B.C., however, the Romans attacked Veii, and after a series of contests it was taken and destroyed by Camillus in 396 B.C. At this time the Etruscans had also to defend themselves against the Gauls. The power of the Etruscans was afterwards completely broken by the Romans, more particularly through the great defeats inflicted in 295 at Sentinum in Umbria, and in 283 at the Vadimonian Lake. By the year 264 Etruria was completely under the power of Rome. Its cities appear to have enjoyed a much superior position to the generality of the Italian towns that submitted to Rome; and Etruria long maintained its national existence, its inhabitants retaining their language, arts, religious rites, and national peculiarities.

Etruria was at the height of its glory at the time of the building of Rome, and served for a model to the new government. Surpassed only by the Greeks in their highest splendour, the Etruscans excelled in architecture, ship-building, medicine, the art of making arms and fortifications, building dykes, and in tactics; they were distinguished particularly for their ingenuity and skill in the construction of all articles of comfort and of luxury. Theatrical entertainments, music, and poetry were not unknown to them. They carried on a considerable commerce in Italy and Greece with their works of art, and founded many important colonies. Their commercial intercourse with the Greeks soon made them their rivals in refinement. They are supposed to have received the germs of their art, which had in itself sufficient charms to create a new epoch in modern taste, from Greece and Egypt, but on this point there is much difference of opinion. What are called the Etruscan vases, with their peculiar bas-reliefs and paintings, have been carefully examined by Millin, and in Boettiger's Treatise on Pictured Vases.

In Pl. LXV. the reader will find eight representations of ancient vases, usually denominated Etruscan vases. See the article VASE.

Fig. 1 represents a very large vase, being 2 feet 3 inches in height. The neck represents the hunting of a stag, in which five figures are engaged, two of whom run it through with spears. The manner of

their hunting is remarkable; each of the two figures immediately engaged has a *pallium* extended, as if to cheat the animal, and lead it to aim its blows in the wrong direction. On the body of the vase is a battle, wherein one man, armed with a crested helmet and cuirass, his only weapon being a sword, fights against two who attack him with lances. Behind the single combatant advances Victory, holding a laurel bough in her hand for the conqueror; her head is covered by a hat closely resembling that of the moderns, except that the brim is broader and raised before. This form of hat appears elsewhere on the vase, on one of the combatants, and also flying off the heads of the hunters, in the speed of their running.

On fig. 2 we see the Egyptian symbol of the cross, which is very rare on Etruscan works.

Fig. 3 represents a goblet of a description frequently used by the Etruscans. It has no means of standing, but terminates in the head of an ox. Round the goblet is a running figure, holding in one hand a dish filled with apples, and in the other a bucket.

Fig. 4 is a vase of a fine full form, with short handles of swans' heads; the sides covered with a picture. On the neck is the bust of a man having the horns of an ox (possibly the horned Bacchus mentioned by Montfaucon in the first volume of his Antiquities); on each side of it is a lion laying its paw on a laurel bough, which terminates in a flower. The body of the vase exhibits on the upper part Cupid addressing his mother Venus, in the lower two figures, that appear to be husband and wife, beside whom stands a tall personage, dressed in a very peculiar manner; round his neck is something like a ruff, his head-dress terminates in points, and in his hand is a long pike or sceptre, on the top of which is a bird like an eagle. He may be a king, or perhaps he is Jupiter, but the size of the engraving is not competent to render the particulars of his dress.

Fig. 5 is a very extraordinary description of a vase, two different stories being represented, a division between them being formed by a river, or more properly the sea, if we may judge from the strange figures of the fishes. The picture above the stream is the sacrifice of a bull; a priestess places a chaplet on its head, and fastens it on the horns. Below are two winged figures, one of them flying; between them is seated a woman; each of the three figures have chaplets in their hands.

In fig. 6 are represented Bacchantes. The male holds a cup in his hand, and the female an instrument which resembles a cymbal; between them stands an altar, over which, at some distance, is an instrument with three raised points.

Fig. 7 is a bowl having a lid upon it; the handles are remarkably graceful in their twisting.

The remaining fig. 8 has nothing very particular about it; the reason of its choice having been its variety from the others. The figures on the side are Bacchus and his train.

The Etruscan painters were unacquainted with the mixture of colours and the distribution of light and shade: their common colours were black and brownish red. Among the most important works on Etruria are O. Müller's Die Etrusker, and Dennis's Cities and Cemeteries of Etruria.

ETTLINGEN, a town of the German Empire, grand-duchy of Baden, on the Alb, and the railway to Carlsruhe, from which it is 5 miles south-east. It is an ancient place, containing some Roman remains; is entered by three gates, and has a castle with gardens, a church, town-house, hospital, normal and other schools, manufactures of linen and cotton goods, starch, leather, and paper, and cotton, gypsum, oil, and numerous other mills. Pop. 5092.

ETTRICK, a pastoral district (parish) of Scotland, in the county of Selkirk, in which the river Ettrick takes its rise. Anciently the district was covered with wood, and though now denuded of trees, it is still called *Ettrick Forest*. St. Mary's Loch is in this district, which was also celebrated as one of the hiding-places of the persecuted Covenanters. This is the subject of Hogg's tale, the Brownie of Bodsbeck.

ETTY, WILLIAM, an eminent painter, was born at York, on 10th March, 1787. Through the kindness of a relative he was enabled to gratify his desire of becoming an artist, and entered as a student at the Royal Academy in January, 1807. He subsequently became an in-door pupil for twelve months of Sir Thomas Lawrence. For many years his progress was very slow and discouraging, the pictures which he sent for exhibition to the Royal Academy and the British Gallery being year after year returned to him. He worked hard and perseveringly in endeavouring to improve himself; but still the general impression among his associates regarding him was that of a diligent and plodding student, who would never attain excellence as a painter. In 1816 he paid a visit to Italy, and derived considerable benefit from his study of the various objects of art in this country. In 1820 he first succeeded in attracting public attention by a small picture entitled Pandora, exhibited at the British Gallery; and still more effectually by the Coral Finders, exhibited the same year at the Royal Academy. Another laurel was added to his growing reputation in the following year by his Cleopatra arriving in Cilicia. In 1822 he made another journey to Italy; and in 1824 his picture of Pandora crowned by the Seasons procured for him the honour of being elected an associate of the Royal Academy. His fame was now fairly established, and he gradually took rank among British painters as the head of a peculiar school, and the first colourist of his day. Among his subsequent pictures may be mentioned more especially his Ulysses and the Syrens, in the Royal Institution of Manchester; Youth at the Prow and Pleasure at the Helm, in the Vernon collection; and the Judith series, Benaiah, and Woman pleading for the Vanquished, in the National Gallery at Edinburgh. Etty's great aim, as he informs us in his Autobiography, was to impress some grand moral truth; patriotism, for example, being illustrated in Judith, valour in Benaiah, and the importance of resisting sensual pleasure in Ulysses and the Syrens. Through all his works his highly poetic and imaginative genius shines conspicuously forth. In colouring and the representation of the nude or partially nude human figure, particularly females, he displays an ability unequalled by any of the modern, and almost unsurpassed by any of the older painters. Though extremely susceptible of the tender passion, and almost constantly engaged in some 'affair of the heart,' Etty never was married, his house being kept by his niece. His moral deportment was of the most unblemished order. With the exception of occasional visits, his life was entirely spent in the exercise of his profession in London till 1848, when he took up his abode in his native town of York. In the summer of 1848 an exhibition of his pictures, numbering about 130, took place in the rooms of the Society of Arts, in the Adelphi, London, and this magnificent display of as many of his works as could be collected together may be said to have been the crowning triumph of his life. His health had been for some time failing, and on the 13th of November, 1849, he expired at York.

ETYMOLOGY (Greek *etymologia*, from *etymon*, the true literal sense of a word according to its origin, from *etymos*, true, and *logos*, discourse, account —literally a discourse on, or account of, the origin of

words) is that part of grammar which takes cognizance of individual words, in contradistinction to syntax, which has regard to the joining of words together so as to form sentences. It is divided into three branches:—(1.) *Classification;* (2.) *Inflection;* (3.) *Derivation.*

1. By the *classification* of words is meant their division into different parts of speech, with explanation of the purpose served by each particular part. In English, words have been generally divided into nine parts of speech, namely, noun, verb, adjective, adverb, pronoun, preposition, conjunction, article, and interjection. The interjection is not properly a part of speech, as it does not enter into the composition of sentences, being merely a sudden involuntary exclamation prompted by some strong feeling or emotion. The noun, verb, adjective, and adverb are called *notional* or *predicative* parts of speech, because they are the main parts as far as the expression of real things or notions is concerned; the pronoun, preposition, and conjunction, *relational* parts of speech, because they are employed in connecting together, and showing the relation between, these other parts in the development of sentences. The *relational* parts of speech are also called *demonstrative.* The words comprised under the term *article* are of duplex origin —the *indefinite* article, *a* or *an*, being the unemphatic form of the numeral *one;* and the *definite* article, *the*, the unemphatic form of the demonstrative *that.* It is believed that the noun is the primary element in all language, and that the other *notional* parts, the verb, adjective, and adverb, are only modifications of it. When we say that a noun is the name of a thing, we mean that it is a word by which we express our conception of some object, or rather our conception of the most prominent quality in it. The name we give it, therefore, points out or refers to this quality or attribute, and in so doing suggests the entire body of attributes associated with it, and so the object itself. Hence, we see that nouns in their origin are *abstract* and not *concrete.*

2. By the *inflection* of words we mean those changes which they undergo to express various relations and meanings. Inflection is divided into three branches:—(*a*) *Declension*, or the change made upon nouns, pronouns, and adjectives to indicate gender, number, and case; (*b*) *Comparison*, or the inflection of adjectives and adverbs to express various degrees of the quality conveyed by them; (*c*) *Conjugation*, or the inflection of verbs to signify person, number, time, and the like.

3. By the *derivation* of words is meant the investigation of their origin, growth, and structure, and to this branch of the subject the term *etymology* is popularly restricted.

Many philologists believe that language has its origin in *onomatopœia*, that is, in an attempt to imitate and represent natural sounds by the voice, with the view of suggesting the objects or actions producing these sounds, or objects in some way related to them, or fancied to be so, as by resembling them in some prominent quality. Mr. Peile attributes considerable influence to the interjectional element along with the imitative. 'That,' says he, 'all language did originally spring from imitational and interjectional sounds *combined*—not from one or the other separately, as has been implied sometimes, I for one firmly believe, not seeing any other possible origin for language.' To take a single example, which illustrates both the imitational and the interjectional or instinctive principle:—In several languages the word for *gape* (Sanskrit *cha*, Greek *chainō* (*chaō* not used), Armoric *genaoui*, English *yawn*) is an imitation of the sound naturally made with an open mouth. Now, one prominent characteristic of the *goose* is its habit of gaping when it utters its cry, and a natural name for it is the *gaper*, or rather *the crier with an open mouth* (*chēn kechēnōs*, Athen. p. 519, A). We find it actually thus described in several languages, as Sanskrit *hansas*, Greek *chēn*, Latin *anser* (for *hanser*), Slavonic *gusi*, *gonsj*, Bohemian *gos*, Armoric *gwaz*, English *goose* (Old English *gōs*) and *gander*. The Gothic and Old English (Anglo-Saxon) *hana*, German *hahn*, and Scandinavian *hane*, a cock, have a cognate origin, and are thus allied to the Latin *canere*, to sing. But although it is not difficult in many words to trace them back to an onomatopoetic origin, by far the greater proportion of words in every language have so changed from their original shape by phonetic decay and other causes, that it is utterly impossible to exhibit how, from originally representing sounds, they came to have their present senses. When we cannot effect this we must be content to trace them back to certain stems known as 'roots.' These roots are ascertained by *analysis*, that is, by separating the part containing the fundamental sense from the elements used to modify it. One or two examples must suffice. 'In the English word *enmity*,' says Mr. Wedgwood, 'we recognize the termination *ty* as the sign of an abstract noun, and we understand the word as signifying the state or condition of an *enemy*, which is felt as the immediate parent of the English word. Now, we know that *enemy* comes to us through the French *ennemi* from L. *inimicus*, which may itself be regularly resolved into the prefix *in* (equivalent to our *un*), implying negation or opposition, and *amicus*, a friend. In *amicus*, again, we distinguish the syllable *-us* as the sign of a noun in the nominative case; *-ic*, as an element equivalent to the German *-ig*, or English *-y* in *windy*, *hairy*, &c., as an adjective termination indicating possession or connection with; and finally, the radical element *am*, signifying love, which is presented in the simplest form in the verb *amo*, I love. Here our power of analysis is brought to a close.' Similar analyses of the words *immortality*, *stability*, bring us to the onomatopoetic roots *mr*, to grind, and *st*, to stand, both of which are common to most, if not all, the Aryan tongues, and by analyzing *immemorial* we get as the ultimate result a root, *mn*, to think (from a simpler root, *md*, to measure), common also to all the Aryan tongues. Now, this identity of root in the various tongues is not accidental, neither are the classical and other forms borrowed from the Sanskrit. Our own word *immemorial* is clearly borrowed from the French word of the same form, while the latter is equally clearly derived from the Latin *immemor*. But the classical *mor*, *sta*, *men*, are not in the same way descended from the Sanskrit *mar*, *sthâ*, *man*. They are *cognate*, that is, they have a common origin, and point to a time when the ancestors of the peoples speaking these tongues formed part of one common family. This common family is believed to have inhabited the lofty table-land of Central Asia, and their tongue has been called the Aryan tongue, while the languages of which it is the parent have been called the Aryan or Indo-European tribe of tongues. This distinction between *cognation*, or relationship, and *derivation* is always to be clearly kept in view. It is seldom sufficiently observed in our etymological dictionaries. The dialects which the Teutonic invaders brought to England were not derived tongues, and the language which resulted from their amalgamation was not derived. It is only in the case of words added to the language subsequently that derivation has place. There is, indeed, in the case of peoples speaking their native tongue, no such thing as derivation; thus, our *father*, *mother*, *brother*, are not derived from Latin *pater*, *mater*, *frater*, but *paternal*, *maternal*, *fraternal* are clearly so

derived, as are French *père, mère, frère*. English *sun* is regarded as cognate with Latin *sol*, Greek *hēlios*, but *solar* and *heliotrope* are consciously formed derivatives.

Starting now with the root *mr*, common, as we have said, to all the Aryan tongues, and one of the most prolific, and following it along a single line, we see how, by the addition of elements, a word is built up. By the insertion of *o* we get *mor*. By the addition of the demonstrative letter *t* we get *mort*. This is called a crude stem. By the addition of *s*, the sign of the Latin nominative, we have *morts* (*mors*), death. By the addition of affixes to the crude stem of *morts* we get Latin *mortalis, immortalis, immortalitas*, whence we have our own words *mortal, immortal, immortality*. It will be observed that this is just the reverse of the process employed on the word *enmity*. That exhibited the *analysis* of a word; in our treatment of the root *mr* we have endeavoured to give an example of *synthesis*, which is the process by which composite words are built up.

If we now take the English word *mind*, which we at once see is cognate to the classical *men* and Sanskrit *man*, to think, we find that it has alliances in another direction. The English *mind* is the Danish *minde*, and its radical element, *mn*, appears in Swedish *minne*, Icelandic *minni*, Old High German *minna*, Gothic *munds*, Old English *myne*,—all meaning memory; also in German *meinen*, Gothic *ga-munan*, to think. These Gothic forms are not derived from the classical or Sanskrit. The Teutons, then, as well as the embryo Latins and Greeks, once inhabited the Aryan land. But a wider induction shows us that not only these, but the Celts and Slaves of Europe, as well as the Persian and several other Asian tribes, are all sprung from a common ancestry, and all of them are therefore classed together as members of the Aryan or Indo-European family. This great family of tongues has been divided into six groups: viz. Indic, Iranian or Eranian, Celtic, Græco-Latin, Gothic, and Slavic. A more minute examination enables us still farther to subdivide these groups. Taking for examination the Gothic group, with which we are mainly interested, we find it divides into two main branches —the Scandinavian and Teutonic or German. The former comprises the Icelandic, Norse, Danish, Swedish, and the tongue of the Faroe Islanders, all closely related to each other, Icelandic being the oldest member. The Teutonic branch also divides into two—viz. High-German and Low-German. High-German includes Mœso-Gothic and Classic German, or the dialect of Saxony, which Luther ennobled and raised into a classic tongue by his beautiful translation of the Bible. It is, however, with the Low-German division we have chiefly to do. This includes Old Saxon, Frisian, Dutch, Platt Dutch, or the language of the inhabitants of the flatter and more northern parts of Germany, including the Baltic provinces of Hanover and Westphalia, and the city of Hamburg; and Anglo-Saxon or Early English, which time and countless modifying circumstances have developed into Modern English. English shows itself to be a member of the Low-German group (1.) by its native vocabulary, and (2.) still more by its grammatical structure.

The principal constituent of our English vocabulary, in addition to the purely English (Anglo-Saxon) element, is Latin, either immediate or through the medium of the French. It has been estimated that the pure English words are only about a half of those of Latin origin; yet in any given passage we find that about thirty-two out of every forty words are Saxon. Thus, in three acts of a play of Shakspeare, we get thirty-six Saxon words out of forty; in Paradise Lost thirty-two; Pope's Essay on Man yields thirty-two; Macaulay's Essay on Bacon, thirty; &c. 'With respect,' says Mr. Marsh, 'to the signification of words, as a clue to the linguistic source from which they are derived, it may be observed that, in general, the familiar names of the members and organs of the body and their functions, the words indicative of the common duties, cares, labours, and passions of rural and domestic life, in short, of all those primary objects, arts, and sentiments with which we become acquainted, not through books, but by the daily round of human experience, are Saxon. . . . The next comprehensive rule is that monosyllables, of whatever class, and words compounded and derived from monosyllables which exist independently in English, are Anglo-Saxon. To this general statement there are many exceptions.' In addition to Latin, we have many words from Hebrew, Greek, Spanish, Italian, and Portuguese, from Celtic, from the other members of the Teutonic family, and from the tongues of distant countries with which we are connected by commerce, colonization, and the like. The words we get from Greek are mostly of a philosophical and scientific character, as *philology, archæology, zoology, æsthetics, mathematics, geology, geography*, &c. The Romans left us only six known words, chiefly local names connected with military stations—*ceaster*, from *castra*, a camp, as *Lancaster; street, strat*, from *strata* (*via*), a paved way, as *Stratford; coln*, from *colonia*, a colony, as *Lincoln; port*, from *portus*, a harbour, as *Portsmouth; wall*, from *vallum*, a rampart, as *Wallbury;* and *foss*, from *fossa*, a ditch, as *Fossaway, Fosbury*. The introduction of Christianity brought in many Latin words of a religious character, as *altar, chalice, cloister, creed, fast, font, mass, pagan, pall, porch, breach, saint, shrine, sacrament*, &c. The principal accession, however, to our language from the Latin came to us through the Normans, from whom we got most, if not all, words relating to feudalism and war, as *array, assault, baron, battle, champion, chivalry, dower, esquire, fealty, peer, scutage, scutcheon*, &c.; to law, as *advocate, arrest, assize, contract, estate, felony, judge*, &c.; and to the chase, as *brace, chase, couple, covert, falconer*, &c. Almost all the Latin words which passed into the French language suffered abbreviation by apocope or syncope, and the words coming to us through that channel evidence a similar mutilation. Those which we took from Latin direct retain their stem entire and are modified only in their terminations to accommodate them to the grammar, which is strictly English or Saxon. Compare *desire, desiderate; envious, invidious; dowry, dotation; sure, secure; vowel, vocal; rule, regular; loyal, legal; royal, regal; round rotund; mean, medium;* &c. &c. In each of these examples the former word is immediately from the French, and the latter from the Latin. It will be observed that though of common origin, they do not exactly agree in sense. No language, as a general rule, is so rich in vocables as to be able to appropriate two forms to exactly the same signification and use. It will very often be found, therefore, that we have made over the word we have taken from the French to the language of common life, while the word of directly Latin origin is used on occasions of formality and ceremony. A similar duplicity of form and sense is observed in those Gothic words which came to us both from a Norman and a native source. Compare *wise, guise; ward, guard; warrant, guarantee; wile, guile; wage, gage;* &c. &c. In each of these the former word is native, and the latter Norman. The French word *guerre*, from Old High-German *werra*, shows not only how Gothic words were modified in Gaul either through Celtic or, as Mr. Peile suggests, through Latin influence, but also

how the Frankic element in the population of that country, like the Oscan among the Latins, dictated the military terms. As an example of the tendency of the French to soften down or elide the Latin and Greek consonants, we may notice the different treatment the Greek word *episkopos*, Latin *episcopus*, received on entering the French and English languages. By cutting off the terminational part we get the crude stem *episkop*, which the French transmuted first into *cresque* and then into *crêque*. The early English, with their usual fondness for the aspirated sibilant, contented themselves with changing *sk* into *sh* and *p* into Low-German *b*, making the word *biscop, bishop*.

The Celtic elements of modern English are divisible into three classes:—(*a*) Those words which were handed down from the original Celts of Britain and now form part of the language. This class includes many names for natural objects which are not so much used as distinct generic words as constituents of place-names. Among these are, *aber, inver, humber, cumber* (all forms of the same word, *Cwmry* being allied to them), *ard* (high), *ath* (a ford), *auchter* (a summit), *augh* (a field), *avon* (water), *bal, bally* (a town), *ben* (a hill), *car, caer* (a fort), *cairn* (a heap of stones), *cam* (crooked), *cambus* (a curve), *craig, carrick* (a crag), *drum* (a ridge), *dun* (a fort), *innis, inch* (a pasture—hence a small island pasture), *ken, can* (a head), *knock* (a hill), *lin, linn* (a pool), *more* (great), *ross* (a promontory), *strath* (a valley), &c. It includes also some words common in the current language, as *basket, button, clout, crook, kiln, darn, gruel, gown*, &c. (*b*) Those of late introduction, which, though true Celtic words, are not original constituents of our tongue, as *flannel, tartan, plaid, kilt, whisky*, &c. (*c*) Those that have come to us from the Celtic through some other tongue, Latin or Norman-French, as *druid, bard*, &c.

Din (a noise), *force* (a waterfall), *gar* (to make), *gill* (a ravine), &c., and several place-names, as *Whitby, Derby, Seathwaite, Scafell*, are from the Scandinavian. From the Hebrew we take *ephod, cabala, cherubim, seraphim, amen*, &c.; from Arabic, *admiral, alchemy, almanac, giraffe, gazelle, coffee, sugar, lemon, syrup, sofa, mummy, assassin, sherbet*, &c.; from Persian, *caravan, dervish, azure*, &c.; from Turkish, *scimitar, divan*, &c.; from Chinese, *gong*, with the specific names of various teas, as *bohea, hyson, congou;* from Malay we have *bantam, sago, gamboge, amuck* (as to run *amuck*); from India, *calico, chintz, toddy, curry, lac*, &c.; from the West Indies, *tobacco, potato, maize*, &c.; from North America, *squaw, wigwam;* from South America, *hammock, jerked* (as in *jerked* beef), &c. There are many words thoroughly naturalized in the language that are quite unique in their origin; thus, *simony* is from *Simon*, who thought that the Holy Ghost was to be bought with money; *dunce*, from *Duns* Scotus; *negus*, from a Colonel *Negus*, skilled in mixing this drink; *orrery*, from the Earl of *Orrery* and Cork. Similar words are *brougham, dahlia, tontine, mackintosh, daguerreotype, silhouette*, &c. From names of places we have *currant* (Corinth), *copper* (Cyprus), *cordwain* (Cordova), *damask* and *damson* (Damascus), &c. The word *crawfish*, a crab, exhibits one of the somewhat singular freaks of etymology. The English *crab* is allied to German *krebs*, which last the French borrowed, converting it into *écrevisse*. This we took from the French under the form *crevcys*, which has now assumed the very English form *crawfish*. Sometimes, on the other hand, two words are confounded under one form, and the distinction between them is only clearly perceived when regard is had to their etymology; thus, under the form *rest*, we have a derived word signifying *remainder*, from Latin *resto*, to remain, and a native word signifying *repose*, cognate with German *rast*, Dutch *rust*, ease, quiet, repose.

The root, as we have said before, is the significative part of a word; thus, *bair-n*, Old English *ber-n*, *bar-n*, a child, is made up of the root *bar*, to bear, and suffix *n*. Suffixes, which are largely employed in English, serve to modify the root-meaning; thus, the *n* in *bairn* is identical with *en* in the past participle of strong verbs; hence *bairn* = (one) born or brought forth. So by adding the suffix *-der*, which denotes the agent or instrument, to the verb *spin*, we get *spi(n)der, spider*, the spinner; by adding the suffix *-dom*, signifying state or quality to *heathen, martyr*, we have *heathendom, martyrdom*, the state of a heathen, a martyr. The suffixes *-ship, -hood, -red, -age*, have the same signification as *-dom;* thus, *lordship, friendship; manhood, childhood; kindred,, hatred; bondage, parentage*. The suffix *-ric* denotes jurisdiction, as *bishopric; -er, -yer*, profession, trade, as *cooper, cobbler, lawyer, sawyer; -ry* or *-ery*, collection, as *rookery, peasantry, gentry*, &c.; *-ly*, like, as *courtly, godly*, and so on. Suffixes were once independent words, which, by being appended to principal roots to modify their meaning, gradually lost their independence, becoming mere signs of relation, and being employed only as formative elements. This is clearly seen in the suffixes *-ric* and *-ly*, the former being simply the Old English (Anglo-Saxon) *rice*, a kingdom, dominion, while the latter is merely a contraction of Old English (Anglo-Saxon) *lic*, like, as *godlic*, godly, *eorthlic*, earthly. The French affix *-ment* is adduced by Max Müller as affording an illustration of this principle. It is the distinctive adverbial suffix; thus, from *bon* we have *bonnement;* from *vrai, vraiment*. 'This termination does not exist in Latin. But we meet in Latin with expressions such as *bonâ mente*, in good faith. We read in Ovid, 'Insistam *forti mente*,' I shall insist strongly; in French, 'J'insisterai *fortement*.' Therefore, what has happened in the growth of Latin, or in the change of Latin into French, is simply this: in phrases such as *forti mente*, the last word was no longer felt as a distinct word, and it lost at the same time its distinct pronunciation. *Mente*, the ablative of *mens*, was changed into *ment*, and was preserved as a mere formal element, as the termination of adverbs, even in cases where a recollection of the original meaning of *mente* (with a mind) would have rendered its employment perfectly impossible.'

Words are also modified by prefixes, which in English are of two kinds—those of native origin, and those from classical sources. Of the former we have *a*, on, as *abed, aboard; be*, by, as *before, beside: be*, converting intransitive into transitive verbs, or adding intensity to the meaning, as *bespeak, bespatter; for*, denoting privation or prohibition, as *forbid, forswear; n, ne*, not, as *never, neither; en*, converting adjectives and nouns into verbs, as *ennoble, entomb*, &c. &c.: of the latter, *a, ab, abs*, from, as *avert, abuse, abstract; co, com, con*, together, as *copartner, company, contact; de*, down, as *descend; in*, in, into, as *inside, imprison; in*, not, as *inactive; ob, oc, of, op*, against, as *obstruct, occur, offend, oppose; re*, motion from, reversal, as *recall, return*, &c. &c.

When two words, each of which retains an independent meaning, are united into one, the resulting word is said to be formed by *composition*, and is called a *compound*. Words are thus formed either by combining two native words or two foreign ones, or by making hybrids. *Kinsman, bridegroom, twilight, blackbird* are native compounds. In some the elements have become changed or obsolete, and are not easily recognized, for example, *ban-dog* (bond-dog), *bridal* (bride-ale), *huzzy* (hus-wif), *gospel* (god-spell), &c. *Aqueduct, geography, aëronaut*, are pure foreign

compounds. *Mobocracy, bigamy, handkerchief* are hybrids.

Although etymology affords valuable aid in determining ethnological relationship, its evidence is by no means decisive. It is a handmaid, not a mistress, and like physiology it must always in this use be studied along with history, to which, when clearly speaking, it must in all cases give way. It avails only in the case of tribes continuing to speak their native tongues. Thus, although Frenchmen, Spaniards, and Portuguese speak dialects of the Romance, we know from history that they are not of Latin origin. The Cornish are a Celtic people, and the Shetlanders Scandinavian, yet if we judged them by the language they now use we should classify them both as Teutonic. On the other hand etymology does not materially aid us in determining what proportion of Celtic blood flows in the veins of Lowlanders and of Englishmen, nor to what extent the blood of the Celts of the Hebrides has been affected by that of the marauding Vikings. Yet even in these and analogous cases the evidence of etymology is not to be altogether ignored. Many a Norse term still remains to testify to the presence of Scandinavians in Shetland; *Sutherland* and the bishopric of *Sodor* still speak of their presence in Caithness and the Hebrides; *Thwaite, Thorpe, Force*, and *Gill* are memorials of their dominance on the shores of the Solway, while many a mining term, as *wheal, kibbal*, and *mundic*, as well as many place and family names, still exist to prove that the natives of Cornwall are true Celts.

'By *tre, pol*, and *pen*
You may know the Cornishmen.'

EU (Latin, *Auga*), a town in France, in the department of Seine-Inférieure, near the left bank of the Bresle, 2 miles above its mouth in the English Channel, 17 miles north-east of Dieppe. It stands in a finely wooded valley, and was in early times a place of considerable importance. Besides the castle, which is a lofty pile of imposing exterior, it has a noble cathedral, another Gothic church, and an old embattled gate, said to be Roman. It was in the castle belonging to this place that William the Conqueror married Maud of Flanders. The town was burned to the ground in 1475, by order of Louis XI., to prevent it from falling into the hands of the English. Pop. 4168.

EUBŒA. See NEGROPONT.

EUBULUS, a Greek comic writer, belonging to the middle comedy, who flourished at Athens about B.C. 375. His subjects were chiefly mythological, and many of his plays contained parodies of the tragic poets, especially Euripides. His language appears to have been simple, elegant, and pure.

EUCALYN ($C_6H_{12}O_6$), a non-fermentescible, sweetish, syrupy body got in the fermentation of melitose (which see). It is dextro-rotatory and reduces copper salts like sugar.

EUCALYPTUS, a genus of trees deriving its name from the well-marked connection of the calyx with its lid or *calyptra*, which is forced off by the pistils and stamens when blossoming. These trees are mostly natives of Australia, and are remarkable for their gigantic size, some having been discovered which surpass in size even the *Wellingtonia gigantea*. Ferdinand Müller, the botanist, says that trees of the species *Eucalyptus amygdalina*, 480 feet in length, were met with lying on the ground. *Eucalyptus obliqua* is the scientific name of the white gum-tree. The appearance of a white gum-tree forest has no counterpart in the northern hemisphere. From the base of the trunk up to the minutest branches the bark of the tree is perfectly white, and the leaves of a leek-green colour. Its general aspect is that which a forest of ash-trees would have if their stems and branches were whitewashed. The leaves, on being crushed in the hand, yield an essential oil, which is contained in cavities to preserve them during their perennial existence, and to enable them to withstand the aridity and heat of the climate. The so-called gum which exudes from the trunk of this tree is not a true gum, but a gum-resin of a highly stringent quality.

EUCHARIST (from the Greek *eucharistia*, thanksgiving, from *eu*, well, and *charis*, grace), a name for the Lord's supper, because the Scriptures inform us that Christ, after having taken the wine and bread, blessed them (or gave thanks). See SACRAMENT and CORPUS CHRISTI.

EUCHLORINE. When potassic chlorate is acted on by hydrochloric acid a gas is liberated, which has an intense yellow colour, sweet smell, and bleaching properties. It was noticed as early as 1802, but it was first carefully investigated by Sir H. Davy, who thought it was a definite oxide of chlorine. Subsequently he altered this opinion, and it is now believed to be a mixture of chloric peroxide and chlorine gas. By passing euchlorine through a cooled tube the oxide condenses and the chlorine escapes.

EUCLASE, a rare and beautiful mineral found in Brazil, Peru, and Siberia, which, if more abundant, might be employed for jewelry. It is a silicate of glucinum and aluminium, forming oblique prisms variously modified, transparent, highly lustrous, and very hard; colourless, but sometimes blue or green. It is not acted on by acids, and fuses with difficulty when heated. It is double refracting and becomes electric by pressure.

EUCLID (*Eucleides*), of Megara, the founder of the Megaric school of philosophy. He was a pupil of Socrates, after whose death, B.C. 399, he retired to Megara (most probably his native city) and set up a school of philosophy, in which he blended the doctrines of the Eleatic school with those of his master. He adopted the Eleatic notion of one universal unchangeable existence, and upon this he engrafted the ethical views of Socrates, giving the name of the Good (sometimes also of Reason, Intelligence, &c.) to this universal existence. From its subtlety and disputativeness, the school of Euclid was sometimes called the Dialectic or Eristic.

EUCLID (*Eucleides*), of Alexandria, a distinguished mathematician, flourished about 300 B.C., and taught geometry at Alexandria in the reign of Ptolemy Soter, and extended the boundaries of mathematical science. The severity and accuracy of his method have never been surpassed. His Elements (Stoicheia), in thirteen books, are still extant, and still form the most usual introduction to the study of geometry. The following are the three best editions of the original text of Euclid's Elements: 1. The Oxford edition of David Gregory, forming part of the only edition of the original of the complete works of Euclid (folio, 1703); 2. The edition of Peyrard, in Greek, French, and Latin, accompanied by the Data of Euclid (Paris, 1814–16–18); 3. That of E. F. August (Berlin, 1826). The translations in all languages are numerous. Among the English translations are Dr. Robert Simson's, containing the first six and the eleventh and twelfth books (London, 1756), and Professor John Playfair's, containing only the first six books (Edinburgh, 1795). The other extant works attributed to Euclid are the Data (the only other allowed by Peyrard to be genuine); the Phænomena, an astronomical treatise; Treatises on Optics and Catoptrics; and two treatises on music, one on Harmonics and the other on the Division of the Scale. The genuineness of both of the last two

treatises, and more especially of the second, has been very generally questioned.

EUDIALITE, a mineral found in Greenland, which, when powdered, dissolves readily in hydrochloric acid with the separation of gelatinous silica. It consists of lime, soda, and iron in combination with zirconia and silica, and containing minute quantities of tantalum, manganese, and other elements. It occurs in uniform masses of a red colour, and the crystals belong to the hexagonal system.

A variety of this mineral found in Norway is called EUCOLITE or EUKOLITE. It contains cerium and lanthanum, but in other respects resembles eudialite.

EUDIOMETER, an instrument for ascertaining the purity of air, or rather the quantity of oxygen contained in any given bulk of elastic fluid. Dr. Priestley's discovery of the great readiness with which nitric oxide combines with oxygen, and is then condensed into nitrous and nitric acids, was the basis upon which he constructed the first instrument of this kind. It consisted of a glass vessel, containing an ounce by measure. This was filled with the air to be examined, which was transferred from it to a jar, of 1½ inch diameter, inverted in water; an equal measure of nitric oxide was added to it, and the mixture was allowed to stand two minutes. If the absorption were very considerable, more nitric oxide was added, till all the oxygen appeared to be absorbed. The residual gas was then transferred into a glass tube, 2 feet long and ½ inch wide, graduated to tenths and hundredths of an ounce measure; and thus the quantity of oxygen absorbed was measured by the diminution that had taken place. Other eudiometrical methods were employed by other chemists. Volta had recourse to the detonation of air with hydrogen gas. For this purpose two measures of hydrogen gas are introduced into a graduated tube, with three of the air to be examined, and fired by the electric spark. The diminution of bulk observed after the vessel had returned to its original temperature, divided by three, gives the quantity of oxygen consumed. The action of liquor prepared from sulphur and potash, or sulphur and lime, boiled in water, and the slow combustion of phosphorus, have likewise been employed in eudiometry. Döbereiner suggested the use of little balls of spongy platinum, for the purpose of detecting minute portions of oxygen in a gaseous mixture, in which hydrogen is also present. The moment the substance rises above the surface of the mercury, in the tube containing the mixture, the combination of the oxygen and hydrogen begins. Its action consists in condensing the gases either at the surface or within the pores of the metal itself (see GASES—ABSORPTION OF), and so energetic is it that it enables hydrogen to take one part of oxygen from ninety-nine of nitrogen.

EUDOXUS, of Cnidos, whom Cicero calls the prince of astronomers, lived about B.C. 370, was the scholar and friend of Plato, and travelled into Egypt, where he continued for thirteen years in intimate intercourse with the priests. All his works are lost, but the poem of Aratus on astronomy makes us acquainted with the extent of his astronomical knowledge, for the commentary upon this poem by Hipparchus shows that it is nothing else than a metrical version of the Phenomena of Eudoxus, a work written in prose. Hipparchus has preserved some fragments of the work of Eudoxus for comparison with that of Aratus, and from these it appears that Eudoxus was far from being a competent observer of the heavens, although he does not fall into so many or so gross errors as his versifier. Eudoxus seems to have been the first to introduce an astronomical globe into Greece, and this may account for the great reputation which he acquired and long continued to enjoy.

EUGÈNE, FRANÇOIS, of Savoy, known as prince Eugène, fifth son of Eugène Maurice, duke of Savoy-Carignan, count of Soissons, and Olympia Mancini, a niece of Cardinal Mazarin, was born at Paris, Oct. 18, 1663. Among all the generals and statesmen of Austria, none has rendered more numerous and important services than Eugène. He was great alike in the field and the cabinet. Contrary to his own inclinations, Eugène was destined for the church. He petitioned Louis XIV. for a company of dragoons, but was refused on account of the opposition of Louvois, minister of war, who hated the family of Eugène. Indignant at this repulse, and at the insults offered to his family, and particularly to his mother, Eugène, in 1683, entered the Austrian service, as two of his brothers had already done. He served his first campaign as a volunteer against the Turks, under two celebrated generals, Charles, Duke of Lorraine, and Louis, Prince of Baden, with so much distinction that he received a regiment of dragoons. The distinction he earned at the siege of Belgrade in 1688, at that of Mayence in 1689, and elsewhere, procured for him rapid promotion. Louvois, jealous of the reputation of Eugène, said angrily, 'He shall never return to his country.' Eugène, to whom these words were reported, replied, 'I shall return in spite of Louvois;' and in fact some years afterwards he entered France at the head of a victorious army. War having broken out between France and Austria, he prevailed upon the Duke of Savoy to enter into an alliance with the emperor, and in 1690 received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. He rejected the tempting offers made by France to engage him in her service, and was raised by the emperor to the rank of general field-marshal. After the war in Italy was concluded he was sent to Hungary with the rank of commander-in-chief. He defeated the Turks at the battle of Zenta (September 11, 1697), and obtained on that occasion the applause of Europe, and the entire confidence of the imperial armies, although his enemies, envious of his glory, accused him of temerity in undertaking so hazardous an enterprise. The loss of the Turks at Zenta obliged them to accede to the Peace of Carlowitz, 1699, which was the first symptom of their decline.

The Spanish war of Succession next called Eugène to a new theatre of glory. Italy became the field in which he displayed his military talents. He advanced rapidly through the passes of the Tyrol at the head of 30,000 men, in the face of Marshal Catinat, who endeavoured in vain to arrest his progress. Villeroi was still more unsuccessful, being surprised and defeated, near Cremona, by Eugène (1702). In 1703 he received the command of the army in Germany; and, being appointed president of the council of war, he was the soul of all important enterprises, to which he imparted great activity; and his efficient co-operation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstädt (Blenheim, see BLENHEIM), August 13, 1704, the two heroes gained a decisive victory over the French and Bavarian army, commanded by the Prince of Bavaria and Marshal Tallard, the latter of whom was made prisoner. In 1705 Eugène returned to Italy, where he was severely wounded in an engagement with the French under the Duke de Vendôme, and being obliged to retire from the field, his army was defeated; but Vendôme was recalled, and his successor, the Duke de la Feuillade, could not withstand Eugène, who now hastened to the relief of Turin, stormed the French lines, forced them to raise the siege, and in one month drove them out of Italy. In 1707 he entered France, and laid siege to Toulon;

but the immense superiority of the enemy obliged him to retire into Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. In this situation he maintained that calmness peculiar to great souls: when the officers urged upon him the necessity of providing for his personal safety, 'What need of bandages,' said he, 'if we are about to die here? If we escape, the evening will be time enough.'

After the recall of Marlborough, which Eugène opposed in person, at London, without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked, more particularly after the defeat of General Albemarle at Denain. The Peace of Rastadt, the consequence of the Treaty of Utrecht, was concluded between Eugène and Villars in 1714. In the war with Turkey, in 1716, Eugène defeated two superior armies at Peterwaradin and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. The Treaty of Passarovitz (concluded in 1718) was the result of this success. During fifteen years which followed, Austria enjoyed peace, and Eugène was as active in the cabinet as he had been in the field, when the Polish affairs, in 1733, became the cause of a new war. Eugène appeared, in his old age, at the head of an army on the banks of the Rhine, but returned to Vienna without effecting anything of importance. He died in 1736.

EUGÈNE DE BEAUHARNAIS. See BEAUHARNAIS.

EUGENIC ACID, or EUGENOL ($C_{10}H_{12}O_2$). The essential oil of cloves is a mixture of two substances, eugenic acid and a hydrocarbon identical in composition with essence of turpentine. When oil of cloves is mixed with potash, a soft crystalline mass is formed, and then, if water be added and the whole distilled, the hydrocarbon passes over, and the residue in the retort, consisting of eugenate of potassium, crystallizes on cooling. From this the eugenic acid is separated by a mineral acid, and is purified by distillation. It is a colourless oily liquid, boiling about 251° C. with an acid reaction and a burning taste of cloves. It combines with metallic oxides, forming eugenates, several of which are crystalline and soluble in water. It yields some derivatives: *eugenic anhydride*, a syrupy liquid soluble in caustic potash, and *eugenyl-phosphorous acid*, by the action of phophorous chloride; and *eugetic* and *eugenoxy-carbonic acids* by the joint action of sodium and carbonic acid.

EUGENIUS, the name of four popes.—1. EUGENIUS I., elected Sept. 8, 654, while his predecessor, Martin I., was still living; died in 657 without having exerted any material influence on his times.—2. EUGENIUS II. held the see from 824–827.—3. EUGENIUS III., born at Pisa, was a disciple of St. Bernard of Clairvaux, and abbot of the Cistertian Abbey of St. Athanasius at Rome. He was raised to the popedom in 1145, was obliged to quit Rome in 1146 in consequence of the commotions caused by Arnold of Brescia; returned by the help of King Roger of Sicily in 1150, and died in 1153. St. Bernard wrote for him the celebrated tract De Consideratione Libri V. In his time the Hohenstaufen house first made good their footing in Italy.—4. EUGENIUS IV., from Venice, originally called Gabriel Condulmero, was, in 1408, appointed Bishop of Sienna and cardinal, and was raised to the popedom in 1431. During his time the spirit of reformation was strongly manifested at the Council of Basel. In consequence of his opposition to the latter he was deposed, and Duke Amadeus VIII. of Savoy was elected pope in his stead, under the name of Felix V. The dissensions thus produced were not allayed till his death in 1447.

EUGENIUS, ST., Bishop of Carthage in 480, by his zealous defence of the orthodox faith, incurred the hatred of the Vandals, who had embraced Arianism, and in 484 was banished by Hunneric to the deserts of Tripoli. Having been recalled by Gundamund, he was again arrested about eight years after by Thrasimund, who condemned him to death, but commuted the sentence to banishment. Eugenius took up his residence at Vienne in Languedoc, and founded a monastery, in which he lived till his death in 505. A profession of faith bearing the name of Eugenius, and presented by the African orthodox bishops to Hunneric, is still extant. His festival is celebrated on the 13th of July.

EUGUBINE TABLES, the name given to seven bronze tables found in 1444 at the town of Gubbio, the ancient Iguvium or Eugubium, now in the Italian Province of Perugia, bearing inscriptions in an unknown language, which scholars consider to be that of the ancient Umbrians. These tables are the most important monument of the language in which they are written. Four of the tables are inscribed in Etruscan characters, two in Latin, and the remaining one partly in Etruscan and partly in Latin. For a long time scholars were unable to decipher them; but Latin scholars and orientalists have at last, with the aid of comparative philology, succeeded in overcoming most of the obstacles in the way of their interpretation. The contents of the tables are of no great interest. They refer to the ritual of the priests of the Temple of Jupiter, and indications are found as to the days of sacrifice, and the districts of the town in which each sacrifice took place. The best text is that given in the Glossarium Italicum of Fabretti (Turin, 1867).

EUKAIRITE, a rare mineral found at Skrikerum in Sweden, and in Chili. It is a selenide of copper and silver, and occurs in small leaden-coloured masses which are friable, and soluble in boiling nitric acid. A variety containing thallium is called *crookesite*.

EULENSPIEGEL, TYLL, a name which has become associated in Germany with all sorts of wild, whimsical frolics, which are committed from pure love of fun. It appears to have been placed beyond doubt that a person called Tyll Eulenspiegel or Ulenspiegel did at one time live in Germany, probably in the first half of the fourteenth century, and that he was celebrated for the frolics he practised in all parts of Germany, and in some of the neighbouring countries. But with regard to this personage nothing more is known. The popular account of him in Germany is that he was born at the village of Kneitinger (or Kneiflingen) in Brunswick, and that he died at Mölln near Lübeck, where a gravestone is still preserved bearing an owl and a glass which is said at one time also to have borne an inscription stating that Tyll Eulenspiegel was buried underneath, and that he died in 1350. This account is, however, mere fable. The evidence of the gravestone goes for nothing, since the stone is certainly not older than the seventeenth century, and besides there is another stone at Damme in Belgium which gives equally authentic evidence that Tyll Eulenspiegel has lain buried underneath it since 1301. It is not known at what time all the tricks and frolics currently attributed in Germany to Eulenspiegel were first collected and committed to writing. The earliest edition of Eulenspiegel's adventures is one in High-German, published at Strasburg in 1519 by one Thomas Murner, but he is said to have had for the basis of his edition a collection written in Low-German about 1483. However that may

be, no Low-German account of Eulenspiegel's adventures has come down to our day. As soon as Murner's work appeared, it became very popular, not only in Germany, but all over Europe, and was translated into nearly every European language. In English it first appeared as a miracle-play, with the title, A Merry Feast of a Man that was called Howleglas. A new English edition of the work by Kenneth R. H. Mackenzie was published in 1860. A valuable edition of Murner's original collection by J. M. Lappenberg was published at Leipzig in 1854.

EULER, LEONARD, one of the most distinguished mathematicians of the last century, was born at Basel, April 15, 1707. He learned from his father, a clergyman, the first rudiments of the science in which he was afterwards so distinguished. At the University of Basel he enjoyed the instructions of John Bernouilli and the friendship of Daniel and Nicholas Bernouilli. In his nineteenth year he gained the *accessit* of the prize offered by the Paris Academy of Sciences for the best treatise on the masting of vessels. Catharine I., desirous of completing the establishment of the Academy of St. Petersburg, invited Daniel and Nicholas Bernouilli thither. Nicholas died, and Daniel soon returned to his native country, after having procured a place in the academy for his friend Euler. Euler now constituted the whole mathematical department in the academy, and laboured with astonishing industry; he composed more than half of the treatises in this branch of science contained in the forty-six quarto volumes published by the St. Petersburg Academy from 1727 to 1783; and at his death left about 100 unpublished dissertations, which were successively printed by the society. To the Paris Academy of Sciences he also presented several treatises (among the rest his dissertation Inquisitio physica in Causam Fluxus ac Refluxus Maris, which gained the prize, though Bernouilli and Maclaurin were among his competitors), and carried off or divided ten prizes. In 1741 he accepted an invitation from Frederick the Great to become professor of mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg, where he died in 1783, in the office of director of the mathematical class of the academy.

Euler distinguished himself particularly by his endeavours to perfect the analytic method according to the system of Bernouilli and the Leibnitzian school, and to complete its separation from pure geometry, which Newton's disciples principally employed in their investigations. He first gave the example of those long processes in which the conditions of the problem are first expressed by algebraic symbols, and then pure calculation resolves all the difficulties. In this Euler displayed extraordinary acuteness and a profound as well as inventive genius. He gave a new form to the science. He applied the analytic method to mechanics, and enlarged the boundaries of this science. He greatly improved the integral and differential calculus, of which he afterwards published a complete course, which surpassed everything then extant on this subject. The great questions on the system of the universe, which Newton left to his successors to resolve, were the constant object of Euler's inquiries, and constitute the subjects of most of his prize essays. An extensive dioptric treatise, Sur la Perfection des Verres object. des Lunettes, in the Mémoires de Berlin (1747), was the result of his inquiries into the means of improving spectacles. The share which he contributed by this work towards the discovery of achromatic telescopes is sufficient to distinguish his name in this department also. But in his treatises on physics he often proposes untenable hypotheses, and appears only to be seeking opportunities for calculation. He also employed himself in metaphysical and philosophical speculations. He attempted to prove the immateriality of the soul, and to defend revelation against freethinkers. In his well-known Lettres à une Princesse d'Allemagne, sur Divers Sujets de Physique et de Philosophie (Berlin, 1768–72), he attacks the Leibnitzian system of monads and pre-established harmony; but it is evident that this was not the field for him to shine in. Of his numerous writings we will only mention here his Theoria Motuum Planetarum et Cometarum, his Introductio in Analysin Infinitorum, the work already referred to, which has always been regarded as his greatest production—Institutiones Calculi Differentialis; his Institutiones Calculi Integralis; his remarkably clear Introduction to Algebra; his Dioptrica; his Opuscula Analytica, &c.

EUMENES, the name of two kings of Pergamus. 1. EUMENES I. succeeded his uncle Philetærus, B.C. 263, and shortly after gained a victory over Antiochus Soter, which secured him in the possession of his dominions. He reigned for twenty-two years and then died in a fit of drunkenness.—2. EUMENES II. succeeded his father Attalus, B.C. 197, and, like him, attached himself to the Romans, who, as a reward for his services in the war against Antiochus of Syria, bestowed upon him the Thracian Chersonesus and almost all Asia on this side of the Taurus. He was also indebted to their interference for the successful termination of a war in which he had become involved with Prusias of Bithynia and Pharnaces of Pontus, as well as with the Thracians. At last, however, his conduct in the war against Perseus of Macedonia incurred the suspicion of the Romans, who, in consequence, encouraged his brother Attalus to take arms against him, and also gave ready ear to the complaints brought against him by the King of Bithynia and several Asiatic cities; but before an open rupture was declared Eumenes died, B.C. 159. He greatly extended the library founded at Pergamus by his father, and distinguished himself by his love of literature and science.

EUMENIDES. See FURIES.

EUMOLPUS, a mythical personage of ancient times, celebrated as a poet, warrior, hierophant, and legislator, according to the common tradition a Thracian, the son of Poseidon and Chione, the daughter of Boreas. He is said to have been driven from Thrace for attempting to violate his wife's sister, but to have afterwards returned. The traditions relating to his subsequent career vary. According to one tradition he was requested by the Eleusinians to aid them against the Athenians, and having acceded to the request, was slain in the battle which ensued. According to another tradition it was Erechtheus, the leader of the Athenians, who was slain in the battle, after which peace was concluded between the Athenians and Eleusinians, according to which the Eleusinians were to be subject to the Athenians, but were nevertheless to have the sole right of celebrating the mysteries connected with the worship of Demeter, and Eumolpus was to perform the customary sacrifices. The sacerdotal family of the Eumolpides at Athens claimed to be descended from this Eumolpus.

EUNUCHS. See CASTRATES.

EUODIC ALDEHYDE is the oxidized constituent of essence of rue. The corresponding acid is the eleventh term in the series of fatty acids.

EUPATARIA, or EUPATORIA, a seaport in Russia, in the government of Taurida, on the Black Sea, 40 miles north-west of Simferopol. Having long been possessed by the Tartars of the Crimea (who gave it the name of Kosloff or Kesloff), it is more Asiatic than European in its aspect. It was here that the allied forces landed at the commencement

of the Crimean war (Sept. 14–18, 1854). It was unsuccessfully attacked by the Russians, Feb. 17, 1855. Pop. 7730.

EUPATORIUM, a genus of plants belonging to the natural order Compositæ, containing a great number of species, many of which are natives of America. Their roots are perennial, possessing a rough, bitter, or aromatic taste; the flowers are small, white, reddish, or bluish, in corymbs. More than thirty species inhabit the United States, among them the *E. perfoliatum* (thorough-wort, or bone-set), a common plant in low grounds throughout the Union. The leaves of this plant are opposite, and two joined together at the base form, apparently, a single leaf perforated by the stem.

EUPEN (French, *Néaux*), a town in Rhenish-Prussia, in a pastoral vale on the Wenze, near the frontiers of Holland, 7 miles S.S.W. of Aix-la-Chapelle. It is the seat of a court of law and several public offices, and has manufactures of woollen and linen cloth, hats, soap, leather, and chemicals; paper, flax, and worsted mills; an important trade, chiefly in linen and cattle, and seven annual fairs. Eupen owes its manufacturing prosperity to the French refugees who settled here while the town formed part of the Duchy of Limburg, under Austrian rule. After the Peace of Lunéville, when this duchy was ceded to France, Eupen belonged to the department of Ourthe until the Peace of Paris in 1814, when this town, with other portions of Limburg, was ceded to Prussia. Pop. in 1871, 14,696.

EUPHEMISM, a figure of speech by which one avoids the use of words which directly express anything improper, disagreeable, or painful, by the employment of phrases that suggest the idea intended to be conveyed, in a more delicate manner or under a more cheerful aspect than the direct terms. Thus the Greeks, in speaking of the Erinyes or Furies, came to call them the Eumenides, or well-disposed, gracious goddesses, and sometimes *semnai theai*, 'the august goddesses.' Thus also nearly all languages have some euphemism for death, or to express the fact that one has died. In the Bible, for example, we have the phrases 'he was gathered to his fathers,' 'he has fallen asleep,' &c.; the Romans, with the same intention, said 'he has lived' (vixit); the Germans say 'he is ascended' (er ist hinaufgegangen), or 'he has been made immortal' (er ist verewigt worden), &c.; and we ourselves speak of the 'departed,' or say that 'one has gone to a better world.' The laws of polite intercourse require the frequent use of this figure.

EUPHORBIACEÆ, in botany, a natural order consisting of herbaceous plants, shrubs, or very large trees, which occur in all regions of the globe. Most of them contain an acrid, milky juice. The leaves are usually alternate, sometimes opposite. The flowers are unisexual, generally small, and are very various in their mode of inflorescence. The calyx is monosepalous, with three, four, five, or six deep divisions, furnished internally with scaly and glandular appendages. The corolla is wanting in most genera; where found it is sometimes monopetalous, sometimes composed of distinct petals. In the male flowers the stamens are usually numerous, and are either free or monadelphous. The female flowers are composed of a free, sessile, or stipitate ovary, usually with three cells, each containing one or two suspended ovules. The fruit is dry, or slightly fleshy. Among the genera are the following: *Euphorbia*, *Mercurialis*, *Ricinus*, *Croton*, *Jatropha*, *Hura*, *Buxus*, and *Acalypha*. They abound in caoutchouc. Castor-oil is obtained from the seeds of the *Ricinus communis*. The roots of several species are emetic, of others purgative. *Croton tiglium* affords a drastic purgative oil. In general the family is characterized by acrid, narcotic, and poisonous qualities, residing in a volatile principle that may be dissipated by heat.

EUPHORBIUM, a yellowish-white body which is the solidified juice of certain Euphorbiaceæ growing in the Atlas in Africa and in the Canary Islands. In the plant incisions are made, from which an extremely acrid juice issues; this ultimately resinifies. Euphorbium is sparingly soluble in water; it dissolves in alcohol and ether, and has been separated into two resinous bodies. It used to be employed in medicine, but its effects are too violent and dangerous. It is a powerfully acrid substance, inflaming the parts with which it comes in contact. Inhalation of the dust causes violent sneezing, and irritation of the nose, eyes, and face generally. It also acts as a drastic purgative, and it is said to produce sometimes intoxication.

EUPHRASIA. See EYEBRIGHT.

EUPHRATES, or EL FRAT, a celebrated river of Western Asia, in Asiatic Turkey, having its sources in Central Armenia, at no great distance from the shores of the Euxine, and its embouchure in the Persian Gulf; area of basin, 260,000 square miles; length, including windings, 1716 miles. It is formed by the junction of two large streams, called respectively the Kara-Su and the Mourad-Chai. The sources of the former are situated in the Anti-Taurus, 25 miles N.E. Erzeroom, not more than 90 miles from the S.E. shores of the Black Sea; those of the latter, or Mourad, the most southerly and largest branch, are in the same range, but 70 or 80 miles further east. These two head streams unite near Kaban Maden, about lat. 38° 58′ N.; lon. 38° 30′ E.; from which point the river holds in the main a south-easterly course, until it falls into the Persian Gulf. At Korna, about 200 miles from its mouth, it is joined by the Tigris, and the united streams take the name of the Shatt-el-Arab. In point of current the Euphrates is for the most part a sluggish stream; for except on the height of the flooded season, when it approaches 5 miles an hour, it varies from 2¼ to 3½, with a much larger portion of its course under 3 than above. The upper portion of the river is inclosed between two parallel ranges of hills, covered for the most part with high brushwood and timber of moderate size, having a succession of long narrow islands, on several of which are moderate-sized towns. Towards Lemlun or Lemloom (lat. 31° 45′ N.; lon. 44° 59′ E.) the country is level, and little elevated above the river; irrigation is therefore easy, and in consequence both banks are covered with productive cultivation, and fringed with a double and nearly continuous belt of luxuriant date-trees, extending down to the Persian Gulf. The Shatt-el-Arab has a depth of from 3 to 5 fathoms, and presents banks covered with villages and cultivation. The permanent flooding of the Euphrates is caused by the melting of the snow in the mountains along the upper part of its course. This takes place about the beginning of March, and it increases gradually up to the end of May. The river continues high, and its course very rapid for thirty or forty days; but afterwards there is a daily decrease, which becomes very small and regular towards autumn. From the middle of September to the middle of October the river is at the lowest. The increment of land about the delta has been found to be a mile in thirty years, about double the increase of any other delta. The length of the navigable part of the Euphrates, reckoning from Bir to Bassora, is 143 miles.

EUPHROSYNE (Mirth), one of the three Graces. See GRACES.

EUPHUISM, an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The

name and the style were derived from the Euphues, the Anatomy of Wit (about 1580), and the Euphues and his England (about 1582), of John Lyly; of which Anthony-a-Wood said: 'Our nation is indebted for a new English in them, which the flower of the youth thereof learned.' These books, which became the model of the wits and gallants of the time, and an acquaintance with which was regarded as a test of courtly breeding, were characterized by smoothness and verbal elegance, and chiefly by fantastic similes and illustrations. Most of our readers will recollect Sir Walter Scott's portrait of a Euphuist, or talker of this jargon, in the character of Sir Piercie Shafton, in the Monastery.

EUPIONE, Reichenbach's name for a fragrant colourless liquid produced in the destructive distillation of bones, wood, coal, &c. Some consider that it is a product of the purification of the crude distillate, while Frankland says that it consists chiefly of amylic hydride. It is highly volatile and inflammable; it is insoluble in water, but mixes with oils, and acts as a solvent for fats and resins. It is not readily acted on by ordinary chemical reagents.

EUPOLIS, an Athenian comic poet, classed by Horace with Aristophanes and Cratinus, flourished about 429 B.C., the year in which he is said to have exhibited his first drama. Neither the date of his birth nor that of his death is known with certainty. He is said to have been in his seventeenth year when he exhibited his first drama, which would place his birth about 446 B.C.; and it seems to be not unlikely that he perished in the battle of Cynossema, 411 B.C. He belongs, like Aristophanes and Cratinus, to the Old Comedy. According to Suidas he composed seventeen pieces, seven of which were crowned. His fragments have been collected by Meineke in his Fragments of the Greek Comic Poets, and by Bothe in the Frag. Comic. Graec., belonging to the Bibliothèque grecque of A. F. Didot.

EURASIANS (syncopated from Europ-Asians), a name sometimes given to the 'half-castes' of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras, and Bombay. They usually receive a European education, and speak English with grammatical correctness, although with an accent not altogether agreeable to English ears. The girls, in spite of their dark tint, are generally very pretty, and often become the wives of young officers or civil officials. The sons usually receive appointments in the civil service, or become clerks in merchants' offices. In these situations they are in general very useful, but when they are advanced to higher stations they often become fast in their living, and insolent in demeanour. Although they now find admittance into the best society, they are not as a rule much thought of by Europeans. Among the natives they bear the nickname Chichi.

EURE, a river of France, which has given its name to two departments—that of the Eure, and that of the Eure and Loir. The river rises in the department of the Orne, and falls into the Seine, on the left bank, near Pont-de-l'Arche, after a course of 124 miles, being navigable for about half the distance.

EURE, a department in France, bounded on the N. by the department of Seine-Inférieure, N.E. Oise, S. Eure-et-Loir, S.W. Orne, and W. Calvados; area, 2300 square miles. The surface consists of an extensive plain, subdivided by the rivers which water it into a number of minor plains, which nowhere rise more than 300 feet above the level of the sea. In all these plains the surface appears almost monotonously flat, except at their edges, where the descent to the streams which separate them is generally narrow and abrupt. The Seine, which, by its estuary, bounds the north-west portion of the department, traverses a considerable portion of it in a north-west direction, and receives all its other streams. The climate, though somewhat humid and variable, is temperate, and not unhealthy. Almost the whole surface is profitably occupied, the waste not amounting to one-thirtieth of the whole. Nearly two-thirds are arable, and one-fifth under wood. The vine grows vigorously, but the climate is not so genial as to allow the cultivation of it on a large scale for the purpose of making wine. Its place is found to be more profitably occupied by the plum, cherry, apple, and pear. From the last two much excellent cider and perry are made. In particular spots hemp and flax of excellent quality are grown. The rearing of stock is well understood, and attracts considerable attention. The horses in particular form a lucrative branch of trade. Both game and fish are abundant. The mining and manufacturing works are extensive and important. The smelting and working of iron, copper, and other metals employ about 50,000 people, the copper and zinc works at Romilly being very extensive. The quarries produce building-stone, millstones, and pavement, and there are good seams of fuller's earth and potter's clay. Manufactures have made considerable progress. Among others may be mentioned fine woollen cloth (the celebrated draps de Louviers), linen and cotton fabrics, prints, cotton hosiery, woollen covers, and carpets, ironmongery, pins, leather, paper, glass, and Paris lace. The trade includes, in addition to these articles, cider, perry, cattle, horses, wool, flax, and hemp. For administrative purposes the department is divided into five arrondissements—Evreux, Les Andelys, Bernay, Louviers, and Pont-Audemer; and thirty-six cantons. The department of Eure constitutes the bishopric of Evreux. The town of Evreux is the capital of the department. Pop. in May, 1872, 377,874.

EURE-ET-LOIR, a department in France, bounded on the N. by Eure; W. Orne; S.W. Sarthe; S. Loire-et-Cher; S.E. Loiret; and N.E. Seine-et-Oise; area, 2267 square miles. The surface consists of an extensive plateau of considerable elevation, which in the east presents an almost unbroken flat, very scantily watered, but in the west is less monotonous, being both partially covered by hills and intersected by valleys, in which numerous streams flow. The principal watershed of the department is formed by a ridge of no great height, which stretches across it from south-east to north-west, and divides it into a north and a south basin, traversed by the two rivers which give the department its name—the Eure, which flows north, and carries its waters to the Seine; and the Loir, which takes an opposite direction, and ultimately joins the Sarthe about 13 miles above the place where that river enters the Loire. Each of these rivers receives several small tributaries, and there is also a considerable number of lakes, of which Bois-Ballu is supplied by a series of curious subterranean channels. The waste-land is extremely limited, amounting to little more than one-hundredth part of the whole. Little more than one-tenth is occupied with wood. Almost all the rest is arable, but a considerable extent is occupied by orchards and vineyards. The produce of the orchards is made into excellent cider, but that of the vineyards affords a very indifferent wine. The soil is in general excellent, consisting of a heavy loam, admirably adapted for wheat. In several districts the soil is of a lighter texture, and is better adapted for barley and oats. In some places hemp, flax, and madder are principal crops. Artificial meadows are extensive, and the art of irrigation is well understood and generally practised. The domestic animals include horses, cattle, and sheep, of good breeds. Great numbers of swine

are reared, and large supplies of poultry are sent to the Paris market. Game, particularly hares, rabbits, partridges, and plovers, is very abundant. The only mineral of any consequence is iron, which is worked at several spots, but not very extensively. The department being essentially agricultural, has few manufactures. Eure-et-Loir is divided into four arrondissements—Chartres, Châteaudun, Dreux, and Nogent-le-Rotrou; and twenty-four cantons. The capital of the department is Chartres. Pop. in May, 1872, 282,622.

EURIPIDES, a celebrated Athenian tragedian, born, according to the usual account, B.C. 480, of Athenian parents, at Salamis, on the very day on which the Persian fleet was defeated in the neighbourhood; died B.C. 406. The date given for his birth by the Arundel marbles is 485 B.C.; and Müller upholds the date 481 B.C., on the ground that Eratosthenes states him to have been seventy-five at his death. At first he studied painting, but afterwards applied himself to rhetoric, under Prodicus, and to philosophy under Anaxagoras (not Socrates). Euripides is said to have begun to write tragedies at the age of eighteen, but no play was exhibited by him until B.C. 455, the year in which he exhibited the Peliades. He was not successful in gaining the first prize till the year 441 B.C., and he continued to exhibit till 408 B.C., when he exhibited the Orestes. Most of the short remainder of his life was passed at the court of Archelaus, king of Macedonia, where he was held in the highest honour. He is said to have been torn to pieces by the king's dogs, which were set upon him by two rival poets, Arrhidaeus and Crateuas. The Athenians, wishing to do honour, after his death, to the poet whom the malevolent hostility of a party in Athens had no doubt helped to drive from their city, sent to Archelaus to request that his remains might be given up to them; but the request was refused by Archelaus, who buried them with the greatest honour in Macedonia. The honour paid to Euripides by Archelaus is not the only proof of the estimation in which he was held by foreigners. Plutarch records in his Nicias that on the occasion of the destruction of the Athenian army in Sicily, under Demosthenes, and Nicias by the Syracusans (413 B.C.), many of those who survived, and were made prisoners, obtained their liberty by reciting to their masters some of the verses of Euripides, and he adds that numbers of them on their return home visited the poet to express their thanks to him. In the same passage Plutarch mentions another case in which an Athenian ship, pursued by pirates, sought refuge in the harbour of the Caunians, who at first refused to admit it, but afterwards consented when they knew that some of the crew were able to repeat a few fragments of Euripides. The Athenians themselves did not neglect to do honour to their great poet after his death, for Pausanius makes mention of a statue to him that stood in the theatre of Athens.

Euripides made it a chief aim to awaken the tender emotions. 'He knew,' says one critic, 'the nature of the passions, and had the art of inventing situations in which they could have their full play. Withal he has an elegiac tone, which seldom or never fails of its effect. Most of his characters were once in the enjoyment of distinguished prosperity, and the retrospect, in their present situation, checks the violence of the passions, and lowers them to the tone of lamentation. For this reason, in his tragedies the passions are breathed forth in soft complaints, rather than raised to a lofty height; for the same reason he is so rich in moral sentences and philosophical declamations, as his personages have always coolness enough to reflect on their situation. Euripides knew well what was suited to produce an effect at the moment. The times of boldness, when Æschylus wrote, were past, and the power of the state was beginning gradually to sink. The pathetic manner of Euripides then became popular.' Various faults may be found with his loose plan, his often unintelligible changes of character, his superfluous choruses, and sometimes, too, his subject; but he stands pre-eminent in true, natural expression of the passions, in interesting situations, original groupings of character, and varied knowledge of human nature. He is a master, too, in the art of managing the dialogue, in adapting the speeches and answers to the character, the sex, and station, the known or private views, the present disposition of the speaker, and the necessity of the moment, in short, to all that gives distinctness and individuality to a person. There is, too, a certain tenderness and softness diffused over his writings, which cannot fail to please the mind. He has been often called the *woman-hater;* but this seems to be rather a random charge, and was made probably on account of his many severe strictures on the follies of the female sex. We meet, however, in his works lofty and tender delineations of female character, and his sensibility to the nobler charms of female purity and virtue cannot be denied.

The number of tragedies composed by Euripides is stated by one authority to be seventy-five, of which only five are said to have gained him the prize; according to another authority the total number of his tragedies reached ninety-two, fifteen of which gained him the prize. His extant plays amount to eighteen, or nineteen if the Rhesus be included in the number, as it is by some scholars, although others reject it as spurious. The following are the extant plays of Euripides:—Alcestis, Medea, Hippolytus Coronifer, Hecuba, Heracleidæ, Supplices, Ion, Hercules Furens, Andromache, Troades, Electra, Helena, Iphigenia in Tauride, Orestes, Phœnissæ, Bacchæ, Iphigenia in Aulide, and Cyclops. The most celebrated editions of Euripides are those of Paul Stephanus (Paris, 1602, two vols.), of Barnes (Cambridge, 1694, folio), of Musgrave (Oxford, 1778, four vols. 4to), of Morus and Beck (Leipzig, 1778–88, 4to), and of Augustus Matthiæ (Leipzig, 1813–29, nine vols.; a tenth vol., published in 1837, contains an index and the Vatican Scholia on the Troades and the Rhesus); a very good edition is that of Paley in the Bibliotheca Classica (three vols.) A lexicon to Euripides has been prepared by Constantine and Bernhard Matthiæ (Leipzig, 1841). Valkenaer, Brunck, Porson, Markland, &c., have devoted themselves to the illustration of single tragedies. The works of Euripides have been translated into English verse by Potter (Oxford, 1814).

EUROCLYDON, a tempestuous wind that frequently blows in the Levant, and which was the occasion of the disastrous shipwreck of the vessel in which St. Paul sailed, as narrated in Acts xxvii. 14–44. In the form in which the word is found in the received version it must be taken as made up of the two Greek words, *euros*, the east or rather south-east wind, and *klydōn*, a wave. But the word used for it in the Vulgate is *Euro-aquilo*, a Latin compound signifying a north-east wind; and some of the best MSS. have the reading *Eurakylōn* instead of *Euroclydon*, which is accepted by some as the preferable reading. Even if Euroclydon be the true reading, this form may, as Dean Alford suggested, have arisen from a natural attempt of the Greek sailors who were familiar with the Latin term *Euroaquilo*, as applied to this wind, to make it intelligible to themselves by forming a Greek compound to imitate it. In any case, whatever may have been the true form of the word, it was applied, as is indeed evident from the narrative in the Acts, to a north-east or north-

north-east, and not an east or south-east wind. The wind is represented as blowing from Crete (not 'against it,' that is, the ship, as in the received version of Acts xxvii. 14), while the vessel which contained Paul was coasting under the south shore of the island, and the course taken by the vessel is just that which would have been taken by one driven by a north-east wind. What renders this still more certain is that exactly such a wind is described by sailors of the present day as prevalent at certain seasons (especially in early spring) in the Mediterranean. The name by which the wind is now known is *Gregalia*.

EUROPA, in mythology, the daughter of Agenor, king of the Phœnicians, and the nymph Melia, or Telephassa, and the sister of Cadmus. The fable relates that one of Hēra's attendants stole a paint-box from the toilet of her mistress, and gave it to Europa. Her native beauty, heightened by this means, won the love of Zeus, who, in order to possess her, changed himself into a white bull, and appeared in this shape on the shores of the sea, where she was strolling with her companions. Attracted by the beauty and gentleness of the animal, she even ventured to mount upon his back, when he immediately plunged into the sea with his lovely prize, and swam to the island of Crete. Here he transformed himself into a beautiful youth, and had by her Minos, Sarpedon, and Rhadamanthus. She afterwards married Asterius, king of Crete, who, being childless, adopted her three sons. The continent of Europe was believed to have received its name from this princess.

EUROPE, the smallest of the great divisions of our globe, but distinguished above the rest by the character of its population, the superior cultivation of the soil, and the flourishing condition of arts, sciences, industry, and commerce, the multitude of large and well-built cities, and its power and influence over the other parts of the world.

History.—Of the origin of its name and its inhabitants history furnishes no certain account. It first occurs in one of the hymns attributed to Homer. It is most probable that the first inhabitants emigrated from Asia, the cradle of the human race. Greece was no doubt first peopled by the emigrants. In that country, about 1400 years before our era, grew up the Hellenes, who soon outstripped the civilization of Asia. The most flourishing period of that nation, commonly called the Greeks, was about 430 B.C. Equally distinguished in action and speculation, adorned by the arts and sciences, rich in the noblest productions of cultivated minds, it will remain an object of admiration as long as civilization endures. But with the dissolution of Alexander's empire, which had been raised on the ruins of Grecian freedom, Greece sank into insignificance.

At the same time, another nation was rising in Italy, the Romans, who appeared, indeed, at an earlier period, but made no figure in history till they had become masters of Italy, and had proved victorious in their struggle with the Carthaginians. From that period their power began to extend over all Europe. They subdued the divided Greeks, and transplanted their arts and refinement to the Italian soil. By the progress of the Roman arms Spain, Portugal, France, the coast of England, Belgium, Helvetia, the part of Germany between the Danube and the Alps, the Hungarian provinces (then called Pannonia, Illyria, and Dacia), became known, and received the Roman manners, language, and refinement. Agriculture was introduced, and flourishing cities rose among the wandering nomades. The Christian religion, which spread throughout the wide Roman Empire, was also a powerful instrument in the civilization of most of the European nations. Germany alone resisted the overwhelming power of Rome, and thereby prevented the spreading of Roman civilization in the north of Europe, which still remained unknown in history.

With the fall of the Roman Empire, occasioned chiefly by its separation into the Eastern and Western empires, a great change in the political constitution of Europe was produced, by the universal emigration of the northern nations. These nations poured down upon the beautiful and cultivated countries of the Roman Empire, now in the weakness of decline, and Roman art and science were obliged to give place to the barbarity, the deep ignorance, and the superstition of the middle ages. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. The empire of the Franks was enlarged, under Charlemagne, to such an extent, that the kingdoms of France, Germany, Italy, Burgundy, Lorraine, and Navarre were afterwards formed out of it. About this time the northern and eastern nations of Europe began to exert an influence in the affairs of the world. The Slaves, or Slavonians, founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe. The power of the popes was now becoming more and more felt in Europe, and was carried to its highest pitch by Gregory VII. and Innocent III. The Crusades, which lasted from the end of the eleventh till near the end of the thirteenth century, tended greatly to aid the popes in acquiring the authority in Europe at which they aimed; but they had also the effect of forming a middle class, of leading the peasants gradually to throw off the chains of bondage, and of introducing the arts and sciences through the Arabs and Greeks into Europe.

The revival of letters, by the Greeks fleeing from Constantinople, gave an entirely new impulse to Europe. The establishment of universities, the invention of printing, and the Reformation, served to cherish and develop these seeds of improvement. The feudal contests, the struggle of privileges, led eventually to the acknowledgment and establishment of the rights of the individual. Out of the chaos of the middle ages arose the states of Germany, France, Spain, Portugal, England, Scotland, Switzerland, the Italian powers, Hungary, Bohemia, Poland, Denmark, Sweden, Norway, and Russia. By the capture of Constantinople (1453) the Turks, with their fanatical military despotism, became a European power. Austria, Holland, Prussia, Belgium, and Greece were subsequently added to the number of European states. The attempts of Charles V. and Louis XIV. to become masters of Europe failed; and in the beginning of the present century Napoleon conceived the project of forming, from the European states, a universal monarchy, pursued it for ten years, and failed also. Since the formation of the states of Europe the following have disappeared from the list of independent powers:—Hungary, Poland, Scotland, Bohemia, the minor Italian states; and the various states of Germany, with the exclusion of Austria, have been formed into the German Empire, under the leadership of Prussia.

Description.—Europe is bounded on the W. by the Atlantic, on the N. by the Arctic Ocean or North Polar Sea. On the S. it is separated from Africa by the Mediterranean Sea, which is connected with the Sea of Marmara or Propontis by the strait called the Dardanelles or Hellespont, and the Sea of Marmara, again, is joined on the E.N.E. by a similar strait —the Bosporus—to the Black Sea, or Euxine. The Dardanelles and Bosporus, with the intervening sea, divide Europe from the adjacent shores of Asia Minor.

To the east of the Black Sea the Caucasus range is now usually regarded as forming the southern boundary of Europe; and the Caspian Sea, the Ural River, and Ural Mountains, are usually held to form the eastern boundary. The most northern point of Europe, on the mainland, is Cape Nordkyn in Lapland, in lat. 71° 6′; North Cape, on the island of Mageroe, lies about 4 miles further north. The most southern points of the continent are Punta da Tarifa, lat. 36°, in the Strait of Gibraltar, and Cape Matapan, lat. 36° 17′, which terminates the Morea. The island of Crete, or Candia, reaches a little south of 35°. On the west, Cape Finisterre (coast of Spain) is in lon. 9° 27′ W.; Cape Roca (Portugal), in lon. 9° 28′ W.; while Ekaterinburg in the Ural Mountains lies in lon. 60° 36′ E. Thus Europe may be said to extend, in round numbers, through 35 degrees of latitude, and 70 of longitude. From Cape Matapan to North Cape is a direct distance of 2400 miles; from Cape St. Vincent to Ekaterinburg, N.E. by E., 3400 miles. Owing to the irregularity of the outline of the continent of Europe and its separation into peninsulas, its area, notwithstanding its considerable length and breadth between the extreme points E. and W., and N. and S., does not exceed 3,800,000 square miles.

Europe is remarkably well watered, although its rivers have not so long a course, nor such large cataracts, as those in other parts of the globe, particularly in America. The principal rivers are the Ebro, the Rhone, and the Po, running into the Mediterranean; the Danube, the Dnieper, and the Dniester, into the Black Sea; the Don, into the Sea of Azov; the Volga, into the Caspian; the Dwina, into the Arctic Ocean; another Dwina or Duna, the Vistula, and the Oder, into the Baltic; the Elbe, Weser, and Rhine, into the North Sea; the Seine, into the English Channel; the Loire and Garonne, the Douro and Tagus, the Guadiana and Guadalquivir, into the Atlantic. The Volga and Danube are the longest. Of its numerous lakes, the largest, which, however, bear no comparison with the North American, are in the north of Europe; viz., in Russia, Lakes Ladoga (the largest in Europe), Onega or Peipus; in Sweden, Lakes Maler, Wener, and Wetter. On the borders of Germany and Switzerland is Lake Constance; on the borders of Italy and Switzerland is the Lake of Geneva (Lake Leman); Hungary has the Platten See.

A great part of Europe is mountainous; the southern more so than the northern. The most elevated region is Switzerland, from which there is a descent which terminates on the side of the North Sea and the Baltic in low plains. The lowest and most level parts are Holland and Northern Germany, Denmark, Russia, and Prussia. The highest mountains are the Alps, in Switzerland and Italy, which spread from those countries in various directions, extend westwardly into France, and are connected by the Cevennes with the Pyrenees, which separate France from Spain. One chain of the Alps stretches south towards the Mediterranean; then, taking an easterly course, runs through Italy under the name of the Apennines. Several branches run eastward from the Alps through the south of Germany as far as the Turkish Provinces. Another chain, the Jura, runs to the north, and separates Switzerland from France. In the east of Europe are the Carpathian Mountains, which, on one side, meet the Sudetic range, and on the other the Mountains of Turkey in Europe. Mont Blanc, in Savoy, one of the Alps, which rises to the height of 15,732 feet above the level of the sea, is usually said to be the highest mountain in Europe; but if the Caucasus range be taken as forming the boundary in the south-east between Europe and Asia, Mount Elburz, which rises to the height of 18,514 feet above the level of the sea, must be considered as the highest. It is a fact worthy of notice, that none of the volcanoes of Europe are to be found in any of the great chains of mountains which have just been enumerated. The only one on the continent is Vesuvius, and this is too much detached to be considered as properly forming one of the Apennines. Ætna, in the Island of Sicily, rising to the height of 10,874 feet above the level of the sea, is the largest European volcano. The Lipari Islands, anciently called the *Æolian*, a few miles to the north of Sicily, bear evident marks of a volcanic origin; and in several of them subterranean fires are still in operation. The volcano of Stromboli is in almost incessant activity, and differs, in this respect, from every other with which we are acquainted. The Azores, in the Atlantic Ocean, are doubtless indebted for their formation to the same circumstance as the Lipari Islands; and, indeed, new rocks have risen from the sea in their vicinity within a recent period. An eruption took place at St. George during the present century. Volcanic phenomena are also seen in the Grecian Archipelago, and a violent eruption took place at the island of Santorin in 1866. Iceland, too, presents the most abundant tokens of the presence of volcanic fire, and has often suffered under its devastations. Mount Hecla is the most noted, though not the only source of the eruptions on this island.

Geology and Mineral Products.—From a geological point of view Europe presents certain general characteristics which can here be only briefly indicated. The crystalline and metamorphic formations are represented in Lapland, Sweden, Finland, Norway, the Highlands of Scotland, the western part of the principality of Wales, the half of Ireland, the counties of Devon and Cornwall in England, Brittany and the west of Normandy in France, the most elevated ranges of the Alps, Corsica, the larger part of Sardinia, the shores of Tuscany, Calabria, the north-east of Sicily, Bohemia, Carinthia, Styria, parts of Hungary and Transylvania, half of the east of Turkey and Greece, and the middle chain of the Caucasus Mountains. To the secondary formations belong—the Lowlands of Scotland, half of the central part of Ireland, the north-east, the centre, and the greater part of the southern counties of England, nearly all Western France and Germany, the most elevated summits of the Pyrenees, the regions stretching over both slopes of the Alps, Central and Southern Italy, the north of Sicily, Istria, Dalmatia, half of Western Turkey and Greece, Galicia, large strips along the course of the Volga, and the northern slope of the Caucasus. Finally, the greater part of Russia, Poland, Prussia, all Denmark, the north-west of Germany, Holland, a large part of Belgium, the western counties of England, the basins of the Seine, Loire, Garonne, and Rhone in France, the northern part of Switzerland, the plains of Lombardy, Hungary, Walachia, and Bulgaria, nearly the whole of Apulia, and lastly southern and western Sicily belong to the tertiary formations. Granite, gneiss, syenite, and the calcareous rocks, frequently mixed with mica and slate, are the principal rocks of Europe. Iron, salt, coal, copper, tin, lead, mercury, silver, zinc, cobalt, arsenic, nickel, &c., are found in various parts of Europe, and some of them in great abundance, but gold is very rare in this quarter of the globe. The north of Italy, and the islands of the Archipelago, yield the best kinds of marble known. Sulphur, vitriol, ammonia, nitre, serpentine, and porcelain clay abound in several parts of Europe.

Climate, Vegetation, &c.—Europe enjoys the great advantage of lying almost wholly within the temperate zone. A small portion of it indeed, comprising Lap-

land and the north coast of Russia, does extend beyond the Arctic circle, but it nowhere reaches to the line of perpetual congelation. On the other hand the most southern point of Europe does not reach within 12° of the Tropic, nor even attain a zone where snow is a rare phenomenon. Another great advantage is the great extent of its maritime boundaries, the European continent being, as already stated, a great peninsula, again divided into several peninsulas. This frequent mixture of sea and land tends to diffuse over the latter the equable temperature of the ocean. It is also the means of conveying to the land an immense quantity of vapour, which, falling in rain, furnishes to the atmosphere an accession of heat. It is well known that the west coasts are in general more warm and humid than those that face the east. Now this difference of climate is due wholly to the difference between the ruling winds. The south-west wind, which is in reality the warm equatorial current of the atmosphere, flowing first north but gradually diverted towards the east by its greater velocity as compared with that of the regions it traverses, is the predominating wind of Western Europe. In Ireland the south-west wind, warm and humid, prevails during nine months of the year; on the Continent, its duration, strength, and temperature, decline uniformly towards the east. At St. Petersburg it is still the prevalent wind, but further east it gives way to the cold and dry north-east wind, which is in reality the polar current of the atmosphere, flowing originally south, but diverted westward by its smaller velocity as compared with that of the regions it traverses. From this it will be evident that the heat and moisture of the equatorial zone are continually flowing into the atmosphere of Europe. But this effect is greatly heightened by an oceanic current. The equatorial current of the ocean runs west; but being checked by the American continent it turns north, flows round the Gulf of Mexico, and then, under the name of the Gulf-stream, runs at a little distance from the coasts of the United States, and passing south of Newfoundland, falls with a relatively high temperature chiefly on the shores of Ireland, Scotland, and Norway. At the same time the north shores of Europe are guarded from accumulation of ice by fortunate accidents of structure. The great projection of the continent west of the Obi, and the position of Novaïa Zemlia, stretching forward to lat. 77°, screen Europe effectually from the ice formed on the north shores of Siberia. This ice, when it breaks up, drifts to Greenland, the east coasts of which are never open, while the west shores of Norway in the same latitude are never closed. Thus it appears, that many circumstances concur to favour Europe generally with a peculiarly genial climate, in which the vicissitudes of season are felt without their rigour, and the luxuriance of nature is so far subdued as never to overpower the efforts of industry.

With respect to the vegetable kingdom, Europe may be conveniently divided into four zones. The first or most northern is that of fir and birch. This may be subdivided into the zones of lichen, birch, and fir. The heights inaccessible to other vegetation up to the borders of perpetual snow are occupied by lichens, the most valuable of which are the reindeer-moss and the Iceland-moss. The birch reaches almost to the North Cape; the fir ceases a degree further south. The cultivation of grain extends further in these rude latitudes than might be at first supposed. Barley ripens even under the 70th parallel; wheat ceases at 64° in Norway, 62° in Sweden. In the country of the Samoyedes, in East Russia, the limit of barley is in about 67°. Within this zone, the south limit of which extends from lat. 64° in Norway to lat. 62° in Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above-mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of South Europe. Here the oak still flourishes; but the pine species become rare. Rye, which characterizes the preceding zone, on the Continent, gives way to wheat, and in the south portion of it to maize also. The fourth zone, comprehending the south peninsulas, is that of the olive and evergreen woods. The orange flourishes in the south portion of it, and rice is cultivated in a few spots, in North Italy and East Spain. The deciduous oak here gives place to the evergreen and cork oaks, with edible acorns. The lines which define the region favourable to the growth of each plant generally incline south towards the east; but it is otherwise with the vine, olive, and a few other plants within certain limits. The cultivation of the vine begins on the coast of France, in lat. 48°, passes north of Paris, in lat. 49°, and goes still further north in Germany, where it reaches its north limit; it is still, however, carried on with success on the Volga, in lat. 50°.

The zoology of Europe offers little for remark. The reindeer and polar bears are peculiar to the north. The south alone has lizards and serpents. In the forests of Poland and Lithuania the urus or bonasus, a species of wild ox, is still occasionally met with. Bears and wolves still inhabit the forests and mountains; but in general cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. A few camels are bred in the neighbourhood of Siena, in Italy, in which country also buffaloes are used for draught. The Mediterranean Sea has many species of fish, but no great fishery; the north seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackarel, cod, and salmon. The fisheries thus arising are intrinsically valuable, and have unquestionably exercised a great influence on the early history and advancement of north-western Europe.

Ethnography and Language.—Europe is occupied by many different races, wholly distinct or very remotely connected. The Celts once possessed the west of Europe, from the Alps to the British Islands. The names Alps and Albion, it may be observed, are derived from the same Celtic root, *alb*, white. The Celtic language, at the present day, is spoken only in the Scotch Highlands and the Hebrides (Gaelic), in some parts of Ireland (Erse), in Wales (Cymric), and in Brittany (Armorican). In Spain, as in Britain, the Celts were driven to the west side; the east shores, the Pyrenees, and part of Aquitania were held by the Iberians, of whom the Basques are now the representatives. Their language, the Eskuara, has no discoverable affinity with any other; and the Basques are the only European race who cannot be traced into Asia. Next to the Celtic comes the Teutonic race. Under this name are comprehended the Germans and Scandinavians; the language of the former, including Gothic, Lithuanian, Flemish, Frisian, Anglo-Saxon, &c., extended from Transylvania to North Britain, and from the Alps to the Baltic Sea. The Scandinavians, Danes and Norwegians chiefly, colonized Iceland and the Faroe Islands, Shetland, Orkney, and others of the Scotch islands; and traces of

their presence in Ireland may be discerned even in Ptolemy's map of that island, A.D. 150. The literature of this race goes back to pagan times, and is extremely abundant. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Poles, the Czechs or Bohemians, Esthonians, the Servians, Croatians, about one-third of the population of Hungary, and the Russians. The Vends or Veneti, formerly a powerful nation on the south shores of the Baltic, but now absorbed in the German name, were of this race. An offset of the same stock penetrated to the head of the Adriatic Sea, and founded Venice. In the south and south-east of Europe are the offspring of the Pelasgian stock, speaking the Greek and Latin, which latter absorbed the Etruscan and other languages of ancient Italy. Greek was the language not merely of the Grecian peninsula, but of all the islands and Asiatic shores of the Ægean Sea. Modern Greek or Romaic is spoken within a comparatively limited range, and differs from the ancient tongue chiefly in having lost many grammatical inflexions; hence it is called Aplo-Hellenic or Simple Greek. Modern literary Greek, however, preserves many inflexions which have been lost to the popular speech. The Albanians on the west side of the Grecian peninsula are probably sprung from the mixed Celtic and Dacian population of the Illyrian mountains. At the present day the language of the Skipetars (as they call themselves) is one-third Celtic, and contains much Slavonic. The Teutonic, Slavonic, Greek, and Latin (with the modern tongues derived from them), all belong to what is called the Indo-European or Aryan family of languages. Turkish tribes occupied the steppes north of the Black Sea, probably at an early age. At present the Bashkirs in the South Ural are of Turkish race, to which belong also the Tatars (Tartars) of Kasan, those of the Krim, and the Nogays on the Don. The Ottoman or Othman Turks (so named from their early Sultan, Othman or Osman), after being settled for ages in Asia Minor, at length took Constantinople in 1453, and established their empire in Europe. Previous to this event a body of Turcomans had forced their way into Macedonia, where their descendants still remain. The fishing and hunting tribes of North Siberia also took part in this west movement, and the Finns advancing from the Obi, settled themselves in the countries now called Lapland and Finland. Higher up, from the banks of the Irtish, other hordes of the same nation, mingled with and led by Turks and Mongols, poured down on the valley of the Danube in the ninth century, and founded the Kingdom of Hungary. The language of the Magyars, as the Hungarians call themselves, has not yet lost all resemblance to that of the Ostiaks on the Obi, though it is most nearly related to the Finnish. The inconvenience arising from diversity of speech is much diminished in Europe by the great predominance of the languages of the Indo-European family, which are spoken by nine-tenths of the whole population; the Teutonic, Slavonic, and Latin groups each numbering about 60,000,000. The total population of Europe is about 302,000,000.

Religion.—The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Anglican, Baptists, Mennonites, Quakers, Unitarians, Methodists, Moravians, &c.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion. Among the Laplanders and Samoiedes there are also some heathens, but their number is small.

Political Divisions.—The following are at present the states of Europe:—

States.	Area in Eng. sq. miles.	Population.	Designation.	Capital.
Andorra,	149	12,000	Republic	Andorra la Vieja.
Austria,	240,337	35,904,435	Empire	Vienna.
Liechtenstein,	62	8,320	Principality	Liechtenstein.
Belgium,	11,366	5,087,105	Kingdom	Brussels.
Denmark,	14,553	1,784,741	Kingdom	Copenhagen.
Faroe Islands and Iceland,	40,266	79,755		
France,	204,090	36,102,921	Republic	Paris.
Germany,	208,619	41,058,139	Empire	Berlin.
Great Britain and Ireland,	121,115	31,817,108	Kingdom	London.
European Possessions,	145	173,980		
Greece,	19,353	1,457,894	Kingdom	Athens.
Holland,	12,680	3,618,016	Kingdom	Amsterdam.
Luxemburg,	999	197,523	Grand-duchy	Luxemburg.
Italy,	114,295	26,716,809	Kingdom	Rome.
Monaco,	6	3,127	Principality	Monaco.
Portugal,	34,500	3,995,153	Kingdom	Lisbon.
Azores and Madeira,	1,311	365,821		
Russia and Poland,	1,924,397	69,364,541	Empire	St. Petersburg.
Finland,	134,829	1,830,864	Grand Principality	Helsingfors.
San Marino,	22	7,303	Republic	San Marino.
Spain,	192,967	16,374,844	Republic	Madrid.
Canary Islands,	2,808	267,036		
Sweden and Norway—			Kingdom	
Sweden,	170,592	4,204,177		Stockholm.
Norway,	122,280	1,753,000		Christiania.
Switzerland,	15,992	2,669,147	Confederative Republic.	Berne.
Turkey,	133,994	10,500,000	Empire	Constantinople.
Montenegro,	1,700	120,000	Principality	Cetigné.
Roumania,	46,710	4,200,000	Principality	Bucharest.
Servia,	16,817	1,319,283	Principality	Belgrade.

EUROTAS, a river of ancient Sparta, now called the *Iris* and *Niris* in the upper, and the *Basilipotamo* (King's River) in the lower part of its course, flows in a southerly direction through the valley between the ranges of Taÿgetus and Parnon, and enters the upper part of the Gulf of Kolokythia. Its banks and the dry parts of its bed are overgrown with a profusion of reeds, and hence the well-known appellation of the 'reedy Eurotas' given to it by the ancient poets.

EURYALUS.—1. One of the Greek heroes at the siege of Troy.—2. One of the companions of Æneas, famous for his friendship with Nisus, with whom he was killed, after having forced his way with him into the enemy's camp.

EURYDICE. Among the many women of an-

tiquity who bore this name, the most celebrated is the wife of Orpheus, who died by the bite of a serpent. Her husband, inconsolable for her loss, descended to the lower world, and, by the charms of his lyre, moved the infernal deities to grant him permission to bring her back. This they granted, on condition that he would not look round upon her till he had reached the upper world. Forgetting his promise, he looked back, and lost her for ever. This story has often formed a fine subject for poets—as for Virgil in the Georgics (book iv.), and for Pope in his Ode on St. Cecilia's Day.

EURYNOME, the daughter of Oceanus; according to Hesiod, the mother of the Graces (which see).

EUSEBIUS, surnamed *Pamphilus*, the father of ecclesiastical history, was born in Palestine about 265 A.D., and died about 340. About 315 he was appointed Bishop of Cæsarea. He was at first opposed to the Arians, but afterwards became their advocate, and with them condemned the doctrines of Athanasius. His ecclesiastical history, written, like his other works, in Greek, is contained in ten books, and extends from the birth of Christ to 324. The best editions are that of Valesius (Paris, 1659–73, fol.), and that of Reading (Cambridge, 1720, fol.) It has been translated into English by Parker (1703), Cater (1736), and Dalrymple (1778). Of his Chronicon, with the exception of some fragments of the original, we have only an Armenian translation and the Latin version of Jerome. Besides these there are yet extant fifteen books of his Præparatio Evangelica, which is particularly valuable for the extracts it contains from lost philosophical works. Of the twenty books of his Demonstratio Evangelica, in which he shows the superiority of Christianity to Judaism, we have only ten imperfectly preserved; and, finally, a life, or rather eulogium, of Constantine. Notices of his life may be found in the above-quoted edition of Valesius. His honesty as an historian was fiercely attacked by Gibbon; and although other writers have defended him against the charge of dishonesty, Eusebius himself makes admissions that throw suspicion on the credibility of his history.

EUSTACHIO, Bartolomeo, a physician and anatomist, born at San Severino, in the march of Ancona, soon after 1500; died at Rome about 1574. He studied Latin, Greek, and Arabic at Rome, and devoted himself to the various departments of medical science, more particularly those which relate to the structure of the human body, and was made physician to the Cardinals Carlo Borromeo and Giulio della Rovera; he was also appointed professor in the Collegio della Sapienza at Rome. There is hardly any part of anatomical science which he did not enrich by profound researches or important discoveries. Some of the parts discovered by him have received their names from him: thus the canal that unites the internal ear with the back part of the mouth is called the *eustachian* tube; so also the *eustachian* valve of the heart. Among his works are his Tabulæ Anatomicæ, consisting of plates illustrative of the human body, engraved in 1552, but not published till 1714 (Rome, fol.) The text of this work has never been found. Albinus published an excellent commentary on these tables (Leyden, 1744, fol.) Another of his works, De Anatomicorum Controversiis, is also lost. Besides these we have many other valuable works by him. Boerhaave published an edition of them at Leyden, 1707, which was reprinted at Delft, 1736.

EUSTATIUS, St., one of the Leeward Islands, 15 miles south-east of Saba, and 11 north-west of St. Christopher's, is a huge rock, rising out of the waves, in the form of a pyramid, 29 miles in circumference. Sugar, cotton, and maize are raised here; but the principal production is tobacco, which is cultivated on the sides of the pyramid to its very top. There is but one landing-place, and that, though difficult of access, is strongly fortified. The number of inhabitants, which amounted in 1780 to 25,000, has dwindled down to about 1900. The Dutch occupied without colonizing this island about the year 1600. The first Dutch settlement was made in 1635. In the year 1665 it was captured by an English expedition. After being in the hands both of the English and the French at different times, its possession was finally secured to Holland by the Peace of Ryswick in 1697. In 1781 a large naval and military force, under Admiral Rodney, compelled the inhabitants, who were incapable of defence, to submit at discretion. The English commanders, under the pretence that the people of the island had supplied the United States of America with naval stores, confiscated all private property, and at one blow reduced the unfortunate inhabitants to poverty. In the same year, however, the island was retaken by a small body of French troops under the command of the Marquis de Bouillé. St. Eustatius was again attacked by the British in 1809, and compelled to submit; but in 1814 the Dutch government was restored.

EUTERPE, one of the Muses, considered as presiding over lyric poetry, because the invention of the flute is ascribed to her. She is usually represented as a virgin crowned with flowers, having a flute in her hand, or with various instruments about her. As her name denotes, she is the inspirer of pleasure. See Muses.

EUTROPIUS, Flavius, a Latin historian, who, as he himself informs us, bore arms under the Emperor Julian. The place of his birth and his history are unknown to us. He flourished about 360 A.D. His abridgment of the history of Rome (Breviarium Historiæ Romanæ), written in a perspicuous style, reaches from the foundation of the city to the time of the Emperor Valens, to whom it is dedicated. The most esteemed editions are those of Haverkamp (Leyden, 1729), Verheik (Leyden, 1762, two vols.), and Tzschucke (Leipzig, 1804).

EUTYCHES, a celebrated heresiarch who lived during the first half of the fifth century. He was archimandrite or superior of a monastery near Constantinople, and was an ardent friend of Nestorianism, which taught that there were two distinct persons in Jesus Christ; but he himself fell into the opposite extreme, and declared that after the incarnation there was only a divine nature in Christ under the appearance of a human body. For holding this doctrine he was excommunicated by the Council of Constantinople in 448, but the sentence was reversed by what is called the 'Robber Council' of Ephesus in 449. The two parties now become only more embittered against each other, and carried on the contest with greater obstinacy, each in turn hurling anathemas and sentences of excommunication against the other. At last the Council of Chalcedon in 451 condemned both the doctrines of Eutyches and those of the Nestorians. Eutyches, expelled from his monastery, disappeared from the scene; but his sect, under the name of the Monophysites, continued to maintain itself in the East for a long time after, in spite of the persecutions of the church and the emperors. See Monophysites.

EUXANTHIC ACID ($C_{19}H_{18}O_{11}$). In combination with magnesia it forms Indian yellow or purree. By extracting with water, and boiling the residue with hydrochloric acid, euxanthic acid deposits in groups of yellow needles on cooling. It is soluble in alcohol and ether, but sparingly in cold water. With metallic oxides it forms salts called *euxanthates;* these

with the alkalies and alkaline earths are soluble in water; the others are insoluble. They are almost all of a yellow colour. When the acid or baric euxanthate is heated, water and carbonic acid are liberated, and a neutral yellow crystalline body, euxanthone, is formed. Both the acid and euxanthone give chlorine and nitro-substitution compounds.

EUXENITE, a mineral of very complex composition, which contains the rare elements niobium, titanium, uranium, yttrium, cerium, lanthanum, along with calcium, magnesium, iron, and aluminium. It is met with at different localities in Norway, but is rare. It is sometimes crystallized, but more commonly massive, black with vitreous lustre. It is not acted on by acids, but is decomposed by acid sulphate of potassium.

EUXINE (*Pontus Euxinus*), the ancient name for the Black Sea.

EVANDER, the civilizer of Latium, the son, according to one account, of Hermes and an Arcadian nymph; according to another, of Echemus and Timandra. About sixty years before the Trojan war he was compelled to quit the town of Pallantium in Arcadia; some say in consequence of a civil strife, and others in consequence of having killed his father. He betook himself to Italy along with a colony of Pelasgians, defeated and slew Herilus, king of Prænestè, established himself, with his compatriots in Latium, and built, at the foot of the Palatine Hill, on the banks of the Tiber, a town, to which he gave the name of Pallantium. The Roman legends represent him as teaching the Latins the use of the alphabet, and the arts of agriculture and music, softening their fierce manners by the introduction of more humane laws, and introducing among them the worship of the Lycæan Pan, Heracles, Demeter, &c. In the Æneid Virgil brings his hero Æneas into connection with Evander, who gives him a favourable reception, and becomes his ally against the Latins. Divine honours were paid to Evander by the inhabitants of Pallantium in Arcadia.

EVANGELICAL, a word literally signifying 'pertaining to the gospel' (Greek, *euangelion*), and used in different senses. In one of its senses it is a term used to qualify certain doctrinal views, especially strong views on the question of the atonement, justification by faith, and allied doctrines. In this sense the word, when applied to a whole church, is in Scotland almost synonymous with orthodox. In England, on the other hand, the Evangelical or Low Church party is looked upon as extreme in its views, and is distinguished from the orthodox party, which holds the doctrines above specified in a more moderate form. When used in a less general sense something more is implied in the word. When we speak of an evangelical minister, for example, we mean not only that he is 'sound' in the faith, but that he exhibits peculiar attachment to sound doctrine and peculiar fervency in preaching it. So also when we speak of an evangelical sermon, such a one is meant as contains sound doctrine warmly set forth and inculcated. In another sense the term is applied in Germany to Protestants as distinguished from Roman Catholics, inasmuch as the former recognize no standard of faith except the writings of the evangelists and the other books of the Bible, and more especially to the national Protestant Church formed in Prussia in 1817 by a union of the Lutheran and Calvinistic churches.

EVANGELICAL ALLIANCE, an association of members of the different sections of the Christian church, organized in London in 1846, the preparatory measures having been devised at a conference of friends of Christian union held in Liverpool in the previous year. The assembly at Liverpool was convened by a Scottish circular addressed to the evangelical churches in England, Wales, and Ireland, signed by ministers and other office-bearers of the Free Church, United Secession, Relief, Reformed Presbyterian, Original Secession, Congregationalist, and Baptist churches. This preliminary meeting, which was crowned with success, was followed in 1846 by the meeting in London, when the Evangelical Alliance was formally instituted. At this meeting was adopted a doctrinal basis, which it had been the chief business of the Liverpool conference to discuss and arrange, and which is, in effect, the recognition by the members of the divine inspiration, authority, and sufficiency of the Holy Scriptures; the right of private judgment in their interpretation; the unity of the Godhead, and the Trinity of persons therein; the doctrine of human depravity by the fall; the incarnation, atonement, and intercession of the Son of God; justification by faith alone; the work of the Spirit; the immortality of the soul, the resurrection of the body, the final judgment of the world; the eternal blessedness of the righteous, and the eternal punishment of the wicked; the divine institution of the Christian ministry; and the obligation of baptism and the Lord's supper; it being understood that the summary of doctrines is not to be regarded as a creed or confession, but simply as distinguishing the class of persons whom it is desirable to embrace within the Alliance. A correspondence was speedily opened up with the evangelical churches throughout Christendom, with a view to promote evangelical Protestantism, and to resist the progress of infidelity and Romanism. The Alliance has held its annual conferences at Manchester, Edinburgh, Bristol, Glasgow, Liverpool, &c., and has struck its roots deeply in every part of this country; whilst its foreign ties have been multiplied and strengthened by its energetic and successful efforts in behalf of the oppressed and persecuted in continental churches.

EVANGELICAL UNION, the name under which the sect familiarly known as the Morisonians, which took its rise in Scotland in 1840, organized itself as a separate church. The originator of the body was the Rev. James Morison, a minister of the United Secession Church at Kilmarnock, who taught doctrines which were considered to be at variance with those laid down in the Westminster Confession of Faith. His most distinctive doctrine was on the subject of the atonement, with regard to which he maintained that Christ died for all men without exception, and therefore it was the bounden duty of every human being to believe in his own personal salvation. Another of his doctrines was that man possessed the ability of exercising saving faith by his own unaided faculties, and irrespectively altogether of the Holy Spirit, and that therefore it was both unnecessary and unscriptural to pray for strength to enable us to believe. Election he admitted to be eternal, personal, and unconditional, but held that it came in the order of nature, not before, as Calvinists maintained, but after the purpose of atonement. For holding and proclaiming these sentiments Mr. Morison was suspended from the ministry of the United Secession Church. Three other ministers were ejected from the body on similar grounds. They then began actively to promulgate their views, and in a short time they succeeded in gaining a considerable number of supporters, a number of whom belonged to the Independent body. At length, in May, 1843, they formed themselves into a separate Christian denomination, under the name of the Evangelical Union. The views of the members had before this time undergone considerable modifications. They no longer believed in divine grace as special to believers, but maintained it to be common to all men, and capable

of being resisted and effectually overcome. They no longer taught election to be unconditional, but founded on the divine foreknowledge of future faith.

In point of church government the members of the Congregational Union are independent. A conference is held yearly in Glasgow, in the beginning of October, which, however, exercises no judicial control over the pastors or congregations, but consults for the general interests of the whole, and manages the affairs of the Home and Foreign Missions, as well as of the Theological Institution. In 1872 this body had eighty-one congregations, chiefly in Scotland, but also in the north of England and even in Ireland.

EVANGELIST ISLANDS, a group in South America, off the west coast of Patagonia, near the west entrance of the Strait of Magalhaens, to which they form an excellent guide. They are rugged and barren, lofty enough to be seen at the distance of 20 miles, and are much frequented by seals and sea birds.

EVANS, Sir De Lacy, a British general, born at Moig in Ireland in 1787; died in London, January 9th, 1870. Having received an ensigncy in the 22d Regiment of Foot, he went to India in 1807, where he took part in the war against Ameer Khan. In 1812 he joined the army of Wellington in the Peninsula, and was present at most of the principal battles and sieges of that war, throughout which he distinguished himself by his eagerness to join the most hazardous expeditions. In the beginning of 1814 he was sent to America, and at the battle of Bladensburg (August 24th, 1814) had two horses shot under him. At the head of 100 men he forced the capitol at Washington. He was twice wounded before New Orleans in December, 1814, and was on that account sent home to England, where he recovered just in time to be able to join Wellington at Quatre-Bras. After the Peace of Paris Evans retired into private life, from which he next emerged as a politician at the time of the agitation for a reform of Parliament in the reign of William IV., of which he was an ardent supporter. In 1830 he was elected member for Rye, but lost his seat at the general election in the same year. In 1831 he was, however, again returned to Parliament as member for Rye; and in 1833 he was elected by the constituency of Westminster, which he continued to represent in Parliament for a considerable number of years. In 1835, the British government having permitted the government of Spain to raise 10,000 troops in Britain to act against Don Carlos, Evans accepted the command of this force, which, although raised from the lowest classes of the population, he succeeded in converting into an army of excellent and well-disciplined soldiers. In 1837 he returned to England, and was made a Knight Commander of the Bath. In 1846 he was raised to the rank of major-general. At the outbreak of the Crimean war he was appointed to the command of the second division of the English army, at the head of which he distinguished himself at the battle of Alma, the siege of Sebastopol, and the battle of Inkermann, to be present at which he rose from a sick-bed. For his services during the war he received the thanks of the House of Commons, was promoted to the rank of Knight of the Grand Cross of the Bath, and had the cross of a grand officer of the Legion of Honour conferred on him by Napoleon III. He now resumed his seat in the House of Commons, in which on every opportunity he showed himself as a determined enemy of the practice of selling commissions in the army.

EVANS, William David, the author of the well-known 'Evans Gambit' in chess, born in 1789 or 1790; died at Ostend, August 3d, 1872. He held at one time the rank of commander in the Royal Mail Packet Service, and subsequently the same rank in the service of the Peninsular and Oriental Company. The gambit bearing his name was first played by him in 1833 against Macdonald. It is now one of the most popular openings in chess.

EVANSVILLE, a town in the United States, in the state of Indiana, capital of the county of Vanderburgh, on a height above the Ohio, at the terminus of the Erie and Wabash Canal, and on the Evansville and Crawfordsville Railway, 140 miles southwest of Indianopolis. Owing to a remarkable bend which the Ohio makes here Evansville has sometimes been designated the 'crescent city.' It contains, besides churches and public schools, three public libraries, and a national marine hospital erected by the general government. Coal and iron abounding in the neighbourhood give great facilities to manufactures, and accordingly numerous factories, machine shops, and mills have been erected. The inhabitants include a large proportion of Germans. Pop. in 1860, 11,389; in 1870, 21,830.

EVAPORATION, the formation of vapour at the free surface of a liquid. Evaporation is distinguished from *ebullition*, or boiling, during which vapour is formed in large quantities within the liquid, or more frequently beneath the liquid at the surface of the containing vessel, and rises in bubbles to the free surface. When the surface of a liquid is exposed to a space that is either vacuous or filled with gases or vapours different in composition from that of the liquid in question, evaporation takes place. A portion of the liquid escapes in the gaseous form from the general mass, and, rising into the space, spreads through it according to the laws of diffusion of gases. Supposing the temperature of the space above the liquid to be uniform, the evaporation proceeds (provided there is a sufficient quantity of liquid) until the space is uniformly filled with vapour: and the whole quantity that rises into the space depends, for any particular liquid, solely on the dimensions of the space and on the temperature of it. The presence of other gases or vapours does not interfere with the action except in making it slower than it would be were the space vacuous. A space thus filled with the maximum quantity of vapour corresponding to the temperature of it is said to be *saturated*. If the dimensions of the space be diminished a portion of the vapour is forced to condense; if the temperature of the space falls a portion of the vapour condenses also; while if the temperature of the space is increased, the dimensions remaining unchanged, the space ceases to be saturated, because *the quantity of the vapour that corresponds to saturation is greater the higher the temperature*. Consequently, if there is a supply of the liquid present, more of it will rise in vapour.—When there is not a sufficient quantity of liquid present to saturate the space completely the whole of the liquid evaporates, and the vapour diffuses uniformly through the space. The space is then said to be non-saturated; if there is present one-half or a quarter of the maximum quantity of the vapour that the space could contain at the temperature, it is said to be half saturated, or quarter saturated. If under these circumstances the temperature of the space is reduced gradually, the point is at last reached at which the amount of vapour present completely saturates the space: any farther reduction will cause some of the vapour to condense as dew. The point of temperature at which this takes place is called *the dew-point*. It is by finding the dew-point that the determination of the hygrometric condition of the atmosphere is effected most simply and most accurately. See Hygrometry.

EVE. See Adam.

EVELYN, JOHN, a miscellaneous writer of the seventeenth century, born at Wotton, in Surrey, October 31, 1620; died there, February 27, 1706. After completing his course at Oxford he began to study law at the Middle Temple. In 1641 he visited Flanders, and paid visits to other parts of the Continent between 1644 and 1646, and again between 1649 and 1652. He made some efforts in favour of the royal cause in 1659, on which account he was much favoured by Charles II. after his Restoration. In 1662 he published his Sculptura, or the History and Art of Chalcography or Engraving on Copper, 8vo, reprinted in 1755. On the foundation of the Royal Society he was nominated one of the first fellows, and at its meetings he read a discourse on forest-trees, which formed the basis of his most celebrated publication. This was Sylva, or a Discourse of Forest-trees, and the Propagation of Timber in His Majesty's Dominions; to which is annexed Pomona, or an Appendix concerning Fruit-trees in relation to Cyder, &c. (1664, folio). In the reign of James II. Evelyn was one of the commissioners for executing the office of privy-seal during the absence of the Earl of Clarendon in Ireland. He continued in favour at court after the Revolution, and was made treasurer of Greenwich Hospital. The memoirs of Evelyn, comprehending an interesting diary and correspondence, were published in 1818 (two vols. 4to); and more recently his miscellaneous works have been collected and given to the public. A new edition of the memoirs, revised and enlarged, was published in 1857, and republished with notes, &c., in 1858. They include treatises on gardening, architecture, medals, &c., besides a curious tract, entitled Mundus Muliebris; or the Ladies' Dressing-Room unlocked and her Toilette spread, in Burlesque; together with the Fop's Dictionary, or Catalogue of Hard Names and Terms of the Art Cosmetic, &c., first printed in 1690.

EVERDINGEN, the name of a celebrated Dutch family of painters. Of these CÆSAR VAN EVERDINGEN was distinguished as a portrait and historical painter and architect. He was born at Alkmaar 1606; died, 1679. His younger brother, ALDERT VAN EVERDINGEN, was a celebrated landscape-painter, born at Alkmaar 1621; died, 1675. His sea pieces, in which he represents the disturbed elements with great truth to nature, are particularly celebrated. In forest scenes too he was a master. He is known also as an able engraver by his plates to Renard the Fox.

EVERETT, ALEXANDER HILL, an American diplomatist, born at Boston, March 19, 1792; died at Canton, May 29, 1847. While studying jurisprudence under John Quincy Adams, he published his first essay, in a review called the Monthly Anthology. In 1809 he accompanied Adams to St. Petersburg, where the latter had been appointed American minister plenipotentiary, and in 1812 returned to America by way of England. On his return he followed for a time the legal profession, but three years after he was again in Europe as secretary of legation at the Hague. This post he exchanged for that of *chargé d'affaires* in 1818, and he remained at the Hague in the latter capacity till 1824. The year following he was sent to Spain, and in 1829 returned to America, where he was elected to the senate of Massachusetts in 1830. In 1840 he was charged with a secret mission to Cuba, and in 1846 was sent to China, where he died. He is the author, among other works, of Europe, or a General Survey of the present Situation of the Principal Powers (Boston, 1822); America, or a General Survey of the Political Situation of the several Powers of the Western Continent (Phila. 1827); New Ideas on Population (Lond. 1823).

EVERETT, EDWARD, an American statesman and author, brother of the preceding, born at Dorchester, Massachusetts, April 11, 1794; died at Boston, U.S., January 15, 1865. He was educated for the church, but in 1814 was appointed to the chair of Greek Literature at Harvard College. To qualify himself fully for the duties of this position he came to Europe, and spent two years at the University of Göttingen. In 1818 he came to England, where he enjoyed the intimacy of Sir Walter Scott, Sir James Mackintosh, Lord Romilly, Jeffrey, and a number of other distinguished men. He returned to America in 1819, and entered on the duties of his chair. He also became the editor of the North American Review, which he continued to edit till 1824. In this year he delivered the first of a long series of eloquent addresses and speeches, which placed him in the first rank of American orators, and was elected a member of Congress. In the autumn of 1834 he was elected governor of Massachusetts, an honour which was accorded to him on two subsequent occasions. In 1840 he was nominated minister plenipotentiary in England. In 1845 he became president of Harvard College. In 1852 he was appointed Secretary of State by President Fillmore, and in the following year, after his retirement from the cabinet, was elected to the Congress as senator for Massachusetts; but a year after he was obliged to give in his resignation owing to ill health, and he then retired into private life. A collection of his orations and speeches from 1825–58 has appeared in three vols. (1836–50–58). He is also the author of A Defence of Christianity, which appeared in 1814.

EVERGREENS, plants that retain their leaves in full verdure throughout the winter till the ensuing spring, when they ultimately fall. It was at one time a common error to suppose that evergreens never part with their leaves. This error was countenanced by the Greek mythology, for Theophrastus relates that it was reported that in the neighbourhood of Gortynia, in Crete, a plane-tree grew which never shed its leaves, being the tree under the shade of which Zeus is said to have had his interview with Europa. But Theophrastus was himself acquainted with the fall of the leaves of the evergreens. The cause of the belief that their leaves never fall is that they do not fall until the young leaves have begun to appear, so that trees of this sort are never wholly without leaves. In warm climates many plants retain their leaves for several years, but no such plants are to be found native to temperate and polar climates. Among the best-known evergreens are most of the trees belonging to the order of the Coniferæ, the holly and ivy, box, privet, rhododendron, myrtle, &c.

EVERLASTING FLOWERS, a name applied to certain plants belonging to the natural order Compositæ, from the fact that when dried they suffer little change in their appearance. By the French they are called *immortelles*, and this name has been introduced into our own language as applied to wreaths made of such flowers to be placed beside recent graves as emblems of immortality. The plants to which this name is peculiarly applied belong to the genus *Helichrysum*, and are natives of Cape Colony and Australia; but it is also given to members of allied genera, such as *Antennaria*, *Gnaphalium*, *Aphelexis*, *Phænocoma*, &c. The native women of Australia are fond of decorating their hair with the flowers of *Helichrysum elatum* and *Helichrysum bracteatum*.

EVESHAM, a borough and market town in England, county and 15 miles S.E. of Worcester, beautifully situated in the vale of the same name, on an

acclivity above the Avon, which almost encircles it, and is here crossed by a bridge of eight arches. It is an ancient place, a borough by prescription, and was the scene of a battle fought in 1265, which replaced Henry III. on the throne. It had a celebrated abbey, of which a fine tower and some out-buildings still remain. Evesham sends one member to Parliament. Pop. in 1871, 4888.

EVIDENCE, in its most general sense, means the facts or arguments which establish, or have a tendency to establish, any conclusions. It may be divided into three sorts, mathematical, moral, and legal. The first is employed in the demonstrations which belong to pure mathematics; the second is employed in the general affairs of life, and in those reasonings which are applied to convince the understanding, in cases not admitting of strict demonstration; the third is that which is employed in judicial tribunals for the purpose of deciding upon the rights and wrongs of litigant parties, and is that of which we shall treat here.

According to our system of jurisprudence in common law trials, it is the peculiar province of a jury to decide all matters of fact. The verdict of the jury is, however, to be given, and the trial is to be held in the presence of a judge or judges, who preside at the trial, and are bound to decide matters of law arising in the course of the trial. Whenever, therefore, a question arises, whether any thing offered as proof at such trial is or is not proper to go before the jury as evidence, that question is to be decided by the court, and, unless permitted by the court, it can never legally come to the consideration of the jury. Hence, whatever is so permitted to be brought before the jury for the purpose of enabling them to decide any matter of fact in dispute between the parties, is, in a legal sense, *evidence*, and is so called, in contradistinction to mere argument and comment. This gives rise to a very important distinction at the common law, as to the *competency* and the *credibility* of evidence. It is *competent*, when, by the principles of law, it is admissible to establish any fact, or has any tendency to prove it. It is *credible*, when, being introduced, it affords satisfactory proof of the fact. It follows, therefore, that evidence may be *competent* to be produced before a jury, when it may, nevertheless, not amount to *credible* proof, so as to satisfy the minds of the jury; and, on the other hand, it may be such as, if before them, would satisfy their minds of the truth of the fact, but yet, by the rules of law, it is not admissible. Whether there is *any evidence* of a fact is a question for the court; whether it is *sufficient* is a question for the jury, when the cause is tried by a jury.

Evidence is, in its nature, divisible into two sorts:—first, that which is *direct* and *positive* proof of any fact; and, secondly, that which is *presumptive* and *circumstantial*. It is again divisible, in respect to the mode or instruments of proof, into two sorts:—first, *written* evidence; and, secondly, *unwritten* or *oral* evidence. We are accustomed to consider that as *direct* and *positive* evidence, which is proved by some writing containing a positive statement of the facts, and binding the party whom it affects; or that which is proved by some witness, who has, and avers himself to have, positive knowledge thereof, by means of his senses. Whenever the fact is not so directly and positively established, but is deduced from other facts in evidence, it is *presumptive* and *circumstantial* only. Perhaps, in a strictly philosophical sense, much of the evidence usually denominated *positive* is but *presumptive;* for there is an admixture in it of some circumstances of presumption, though the presumption may usually be deemed irresistible proof. For instance, a promissory note is offered in evidence as signed by the defendant; a witness, who attested it, swears to the execution and signature of the defendant. This is usually deemed positive proof; and yet it will be at once perceived that it rests on the *credibility* of the witness, and the *presumption* that he has sworn what is true, which is a fact that in its nature is not capable of absolute proof. But, however this may be, in a practical sense the distinction above stated is sufficiently intelligible and well-settled for all the purposes of human life.

I. As to *presumptive evidence*. It must be obvious that in a very great proportion of the questions of fact arising in the litigations before judicial tribunals, the proofs must be of a merely presumptive nature. The want of written proofs; the death, or defect of memory, or treachery of witnesses; the temptations to suppress evidence; the very nature of the transaction itself, founded in fraud, or in secret contrivances, or in personal confidence; all these, and many other considerations, require us to recur perpetually to presumptive evidence. And especially is this true in respect to public crimes; for these are rarely committed under such circumstances as lead to positive, unequivocal evidence of them. All presumptions are necessarily founded upon the connection which human experience demonstrates usually to exist between a certain fact or circumstance, and other facts and circumstances. When the one occurs the others are presumed to accompany them. Some presumptions of this nature are so strong and irresistible that the law adopts them as *presumptiones juris et de jure*. Others, again, are left to be judged of according to the weight which the court and jury may think them entitled to, taken in connection with all the other circumstances of the particular case. There are other presumptions, or rather circumstances of presumption, which are so uncertain and unsatisfactory in their own nature that the law rejects them as unworthy of any credit, and too unsafe to found any judgment upon. Thus it is a general rule that hearsay or mere report and reputation of a fact is not evidence, for this amounts to no more than the mere declarations of third persons, not under oath, and of facts of which they may have no certain knowledge. Our law generally requires that every fact to be substantiated against a person should be proved by the testimony of a witness (when it is to be proved orally) who is sworn to speak the truth; or, if it is dependent upon written evidence, it must be proved by evidence that is sanctioned by him, or by which he ought to be bound, as importing truth. There are, however, some exceptions to this rule. Whenever the hearsay or declaration accompanies a fact, or, as it is often expressed, is a part of the *res gestæ*, it may be evidence. The admission of hearsay, too, is limited in extent, even in these classes of cases. It is admitted only to prove public or general rights, and matters of general reputation. But it is said to be inadmissible to prove mere private rights or particular facts; as, for instance, upon a question of boundary, that a post was put down in a particular spot; or in a case of birth, that the birth was in a particular place; or that a party has a private right of way. Presumptions, favourable or unfavourable, often arise from the conduct, or motives, or want of motives, or character, or habits of a party, and may justly influence the decision of a case. But it would lead us too far to enter upon a full illustration of these remarks. On the subject of presumptions the common law has laid down many rules, which, however, in the compass of this article, it is impossible to enumerate.

II. As to *oral* or *unwritten evidence*. Having considered the nature and operation of presumptive evidence, we may now pass to a consideration of some

of the rules of evidence as to witnesses—when they are and when they are not competent to give testimony. In general, it may be said that all persons not under any known disability are competent witnesses. Several grounds of incompetency exist in the common law of England. 1. The first is, want of reason or understanding. Persons insane, lunatics, and idiots are incompetent to be witnesses. But lunatics and persons temporarily insane are, in their lucid intervals or returns of reason, restored to their competency. A person deaf and dumb, if he has sufficient understanding, and can by signs make known his thoughts through an interpreter, or otherwise, is competent. But a person deaf, dumb, and blind would be deemed incompetent. Children are admissible as witnesses as soon as they have a competent share of understanding, and know and feel the nature of an oath, and of the obligation to speak the truth. There can, therefore, scarcely be assigned any precise age for the admission of them as witnesses. And the like circumstances would govern the case of persons whose memory and understanding are greatly impaired by age. If they have too little mind to know the value of truth, or to understand or remember facts, they are incompetent. But if they are not thus deficient they are admissible, and their credit is to be left to the jury.—2. A second ground of incompetency is the want of religious belief. The law, in order to justify the administration of an oath, or a solemn equivalent affirmation, requires that the party should believe that it is obligatory upon his conscience, and that he becomes thus bound to tell the truth. But there is no certain sanction or obligatory force upon the conscience of a man unless he believes that his telling or not telling the truth will, at all events, make him accountable to a Supreme Being for his conduct; and that, if he tells a falsehood, the Supreme Being will punish him accordingly. Our law, therefore, requires that a person, to be a witness, should believe in the existence of a Supreme God, to whom he is accountable for his actions. The rule is usually laid down in our books with this addition—that he should also believe in a future state of rewards and punishments. And it has been accordingly held by some judges that if he does not believe in a state of punishment, but only of reward, in a future world, he is not a competent witness, although he may believe in punishment in the present world for all crimes by the order of Providence. But this doctrine has been doubted and denied by other judges, who think that if a witness believes in a God, and that he will punish him in this world if he swears falsely, he is admissible, notwithstanding he may not believe in a future state, or if he does believe in a future state, that he will be liable to any punishment in such state. But upon such a question, where very able judges have differed, it becomes us to say no more than that the question may still be deemed unsettled. It was formerly a rule that infidels, or disbelievers in Christianity, such as Jews, Mohammedans, and the various kinds of heathen, were not competent witnesses. But that rule has been abrogated for a considerable length of time. Infamy of character (infamy attaching to a person from having been convicted of a crime deemed by the law infamous), and the fact of a person's being legally interested in a case, were formerly also held as grounds of incompetency in a witness. The principle of absolutely excluding evidence in the cases above mentioned has been abandoned by recent statutes, and the objection is now admissible only as affecting the *credibility*, and not the *competency* of a witness. The regulating statutes are 6 and 7 Vict. cap. lxxxv., and 14 and 15 Vict. cap. xcix. The former declares that no person offered as a witness shall hereafter be excluded by reason of incapacity from crime or interest from giving evidence on any issue or inquiry, civil or criminal; and the latter declares that even the parties to a cause shall be both competent and compellable to give evidence on behalf of either or any of the parties, subject only to exception where the question tends to criminate the person examined, or to make husband or wife to give evidence for or against each other, or in cases of adultery or breach of promise of marriage.

In respect to oral or unwritten evidence, there are some other rules which it may not be without use to state. And, 1, as to *admissions*. These, when made by the party himself, or by his agent in the particular transaction, are evidence against him, though not for him. If there are several persons having a joint interest, an admision of one of them in respect to the joint interest is evidence against all. So an admission of one partner, as to partnership transactions, is evidence against all the partners. But in cases of crimes and torts, the rule is more limited. There the admission of one defendant does not affect the others, unless it be a part of the *res gestæ;* or there be proof of a common conspiracy or design, and the declarations of the party respect that design, and are a part of it, or are made in the course of executing it. But the admissions or declarations of an agent are not evidence against the principal, unless they are made in a case within the scope of his employment, or are a part of the *res gestæ*. His admissions at another time, or in another employment, are not so. What he states while he is doing an act, as agent, is evidence; what he states historically afterwards, as to the acts and proceedings under his agency, is not, because better proof may be obtained, for he may be called to appear personally as a witness. There is a distinction in respect to the effect of admissions. In some cases they are conclusive, in some not. They are often conclusive when the party has thereby induced another to act, or give credit. In many other cases they may be contradicted, where they do not operate as a fraud on other persons.—2. Secondly, in respect to *confessions*. The common law seems to have taken a distinction as to the effect of confessions in civil cases and in criminal cases. Generally speaking, they are evidence in civil cases as admissions. In criminal cases, a free, voluntary confession by a party of his guilt is also evidence, and is sufficient, *per se*, to found a conviction; but where a confession has been obtained by duress, or threats, or by a promise of pardon by an agent of the government or the prosecutor, and the promise is not complied with, the confession cannot be given in evidence.—3. Thirdly, as to the number of witnesses. Generally speaking, by the common law, the testimony of a single witness, if believed, is sufficient to establish any fact. There are, however, certain exceptions: First. On an indictment for perjury the evidence of one witness is not sufficient to convict, for that would be only oath against oath. There must be either two witnesses, or strong independent evidence by circumstances to corroborate the testimony of one. Secondly. In cases of treason, by statute in England, there must be two witnesses to the *same overt* act of treason, or one witness to one, and another witness to another overt act of the same treason. Any confession would be sufficient, even when made out of court, if proved by witnesses. But in regard to collateral facts a single witness is sufficient, even in cases of treason. Thirdly, in courts of equity, the answer of the defendant (being under oath) as to facts which it positively and clearly denies, will prevail, unless disproved by two witnesses or one witness and corroborative circumstances. A single witness, without such circumstances, is insufficient. In suits at law the rule is otherwise, and a single

witness here suffices in ordinary cases. The practice in courts of ecclesiastical jurisdiction is, in this respect, like that of the courts of equity.

III. In respect to *written evidence*. This is divisible into various sorts:—1. Statutes or acts of the legislature. 2. Judgments. Those of the superior courts of law are matters of record, and are conclusive. Generally speaking, verdicts and judgments are evidence in cases between the parties to the suit and privies; but they are not evidence in cases between strangers. There are some exceptions to the general rule. *a.* The judgment in a suit between strangers is sometimes admissible, as the record of a judgment against a principal, who has been convicted of a felony, may be given in evidence against an accessory. *b.* Judgments of courts of a peculiar and exclusive jurisdiction are sometimes conclusive upon all persons. Thus judgments *in rem*, in cases of seizures by the exchequer and other courts having exclusive jurisdiction, are conclusive. So sentences of ecclesiastical courts in cases of which they have exclusive jurisdiction. *c.* Judgments in cases of *general rights*, as of a right of common, a public right of way, a custom, a pedigree, &c., are admissible as evidence of such right, custom, &c., in suit between third persons. 3. There are other judicial proceedings which are not strictly matters of record, as decrees in chancery and judgments in inferior courts, to which, however, the same general principles apply, as matters of evidence, as to judgments of record. 4. Depositions also, awards and examinations by magistrates, are often evidence in cases between the same parties. There are also cases in which public writings, not judicial, such as journals of Parliament, public gazettes, rate or tax books, ships' registers, rolls of manor courts, corporation books, and books of public entries, &c. &c., are evidence. But to go at large into the distinctions applicable to them would occupy too much space.

IV. In respect to *private* writings the rules applied to oral testimony are generally applicable here. Such writings are evidence between parties and privies, but not between strangers, except under the limitations already stated. There are some few cases in which the written statements of the party himself may be given in evidence in his own favour, such as, for instance, his account-books, to verify charges made by him in respect to debts and charges, which are properly matters of account, such as debits and charges for goods sold, for labour and services, and for materials furnished. But the most common question that arises in respect to written instruments relates to the mode of proving them to be genuine, or what they purport to be. When the original instrument is produced, if it is objected to, and there is a witness who subscribed it, he must be called to prove the due execution of it by the party whom it purports to bind. If the witness be dead, or out of the country, the handwriting of the witness must be proved by some person acquainted with it, and then it will be presumed that the witness saw the due execution of it; and it is evidence without further proof. If there is no witness who subscribed it the handwriting of the party who executed it may be proved by some person who is acquainted with it. But it is not sufficient to prove it by comparison of the handwriting with the known handwriting of the party, though such evidence may be admitted in some cases as corroborative evidence. And it has been held that in case of deeds even the *admission* of the party that it is his deed, or that he executed it, is not, at least where there is a subscribing witness, proof of the due execution of it. If the instrument is lost, upon proof of the loss (and the party to whom it belongs may be sworn to prove the loss) the contents of it may be established by a copy or other proper proof. After an instrument has been executed thirty years, and any possession has followed, or right been exercised in conformity to it, it is admissible without any proof by witnesses. In respect to *written* evidence a question often occurs how far parole (oral) evidence is admissible to control or affect it. There are two sorts of ambiguities affecting written instruments. One is called *latent* ambiguity, and the other *patent* ambiguity. The latter is such as appears upon the face of the instrument itself, from the doubtful nature of the terms used. The former is where the terms of the instrument are of themselves certain and free from doubt; but the ambiguity arises from some extrinsic matter or fact, collateral to the instrument. As, for instance, if A grant his manor in B to C, and he has two manors in B, the whole difficulty arises, not from the instrument itself, but from the extrinsic fact that he has two manors, for if he had but one that would surely pass. If A devise an estate to his nephew B, and he has no such nephew, but he has a nephew C, there is the same latent ambiguity. In each of these cases, and indeed in all cases of *latent* ambiguity, parole evidence is admissible to show what or who was intended, for as the difficulty arises from parole evidence, that may also be resorted to in order to remove it. But in cases of *patent* ambiguity it is otherwise. Parole evidence cannot be admitted to supply a meaning which the words do not of themselves import, or to give certainty where the words are uncertain. Indeed the general rule in our law is that no parole evidence is admissible to vary, explain, or control written instruments, to add new terms to them, or to limit or restrain the import of the words used in them. The exceptions to this rule are too minute to be here specified.

We will close this outline of some of the leading principles of our law on this subject with an enumeration of a few rules, which did not properly fall under any former head. 1. As to the question on whom the burden of proof (*onus probandi*) lies. Generally it rests on the party who alleges the affirmative of any proposition, to establish it by suitable proof. But sometimes even he who alleges a negative must prove it; as in all cases where the party sets up a criminal neglect or omission, he must establish such neglect or omission by suitable proof; and it is not the duty of the party charged to establish his innocence, for the law will presume it in his favour until there is some proof to the contrary. 2. The best evidence that the nature of the case admits is to be produced. The meaning of this rule is not that, in all cases, the highest possible evidence is to be adduced; but such evidence as presupposes that no better is behind, and in the power of the party. The evidence, for instance, of a written contract is the original instrument; and therefore a copy is not generally admissible. But if the original is proved to be lost, then a copy is evidence; for that is the next best proof. In such case the copy must be proved to be such. Again, oral evidence will not be admitted if there is a copy in existence; but if there is no copy, then it is admissible. But where the best evidence is given, it is not necessary to fortify it by producing all that exists of the same kind. As, if there be two witnesses to a deed, it is sufficient to prove it by one. There are certain exceptions to this rule, founded on public considerations; as, for instance, the original of a public record need not be produced; but a copy is sufficient; for the public records ought, for general convenience and preservation, to remain always in one place. 3. Generally facts only are evidence, and not the mere opinions of witnesses. But there are certain exceptions; as, in questions of science or trade, persons of skill may be asked their

opinions. A physician may be asked if a particular wound or injury would, in his opinion, produce death; and a shipwright his opinion as to the sea-worthiness of a ship. 4. The substance only of any particular point or issue of fact need be proved. This gives rise to a great variety of questions as to the materiality or immateriality of particular circumstances, included in the point at issue; and upon these questions depends the doctrine of variance in our law. What variance is or is not material is often matter of great nicety. 5. There are certain things which courts and judges will judicially take notice of without any proof. They will take notice of all public and general laws; of all general customs of the realm; of the commencement and prorogation of the sessions of the legislature; of the king, president, governor, &c., of the state; of all the courts of general jurisdiction in the same state; of the general customs of merchants and trade; of the ordinary computations of time by the calendar; of the known civil divisions of the country into counties; of public holidays and festivals; of public proclamations, and other public documents of the executive and legislative departments; of the nations with which we are at peace or at war; of the nations and sovereigns acknowledged by our government; and of many other facts which belong to the public proceedings and interests of the country. But of inferior courts of limited jurisdiction, not recognized in public statutes, of local customs and usages, of foreign laws, of peculiar tenures, and, in many instances, of local geographical divisions, not necessarily involved in the discharge of public duties, judges and courts will not take notice. See CONFIDENTIAL COMMUNICATION, DYING DECLARATION, ESTOPPEL.

EVIL, ORIGIN OF, the subject of an appalling quantity of barren speculation. Perhaps the oldest theory upon this subject is that of Parseeism, or the religion of Zoroaster, according to which there were two original principles, one good (Ormuzd) and the other evil (Ahriman). This is the doctrine that is now very often spoken of as Manichæism, from the fact that it was adopted by Manes, who attempted to ingraft it on the doctrines of Christianity. Akin to the doctrine of Manichæism is that of the Gnostics and Neoplatonists, who taught that there was an original formless substance, to which they did not attribute a personal existence, but which they represented as being in its own nature evil, and as always resisting the divine Creator. In contradistinction to these dualistic theories with reference to the origin of evil stand the Monoistic theories of Brahmanism and Platonism. According to the Brahmanic doctrine of the emanation of all things from one original being (Brahma), this original being was regarded as the sole true existence, and the phenomenal world, with all the evils appearing in it, was held to be mere illusion. Similarly Plato held that the good was the essence of all things, and that the evil and imperfect contained in them had no real existence. The theory enunciated by Leibnitz in his Theodicée resembles that of Plato. In that work he assigns to the evil existing in the world created by God, which he holds to be the best of all possible worlds, a merely relative existence; all that we call evil is, he holds, only evil to us because we do not see it in relation to the rest of the universe, for in relation to the universe it is not evil but good, and accordingly cannot be evil in its own nature. The Pantheism of Spinoza agrees with the three last-mentioned theories in denying the real existence of evil. Another view on the subject is that which neither assigns to the evil principle, as to God or the good principle, an original existence nor denies the real existence of evil, but ascribes it to the exercise of man's free-will; but this view, instead of affording us any enlightenment on the subject, only lands us in the endless discussion of the freedom of the human will.

EVIL EYE, a power which, according to an old and wide-spread superstition, resides in some people of doing injury to others by a mere look, or a look accompanied by certain words or charms. The ancient Greeks and Romans believed in the existence of evil spirits, who regarded the human race with malignity and envy, and took pleasure in destroying a man's happiness, especially when in a moment of undue self-confidence he had allowed any expression of arrogance to escape from his lips. They believed also that this demoniac power could be exercised by evil-disposed men, and that they exercised it in various ways, but especially by the look. The Illyrians, Triballi, and all women with double pupils, were credited beyond other people with the possession of this power of exerting a malign influence on others by means of the eye. Our word to *fascinate* is derived from the Latin word (*fascino*) meaning to bewitch in this way, and is connected with the Greek word (*baskainō*) of the same signification. This superstition is still prevalent among the more ignorant classes in Italy, Russia, Andalusia, Turkey, Egypt, the Highlands of Scotland, and other places, and various means are still resorted to, as they were by the ancients, to ward off the baneful influences. Children, from their delicate constitution, were supposed to be particularly obnoxious to such influences, and the ancients were in the habit of protecting them by the use of amulets (Latin, *fascina;* Greek, *probaskania*). Even at the present day the jewellers of Seville sell small pieces of stag's-horn set in silver, which are hung round the necks of children by means of a cord made out of the hair of a black mare; and it is firmly believed that the stag's-horn receives the influence of the evil eye and protects the wearer. To spit three times in one's breast was also believed by the ancients to be a protective against the evil eye; and likewise to make the sign of a horn with the fingers.

EVOLUTION. This term is so loosely used in popular writings that its original meaning is too frequently lost sight of. It is used instead of progress, a term with which is associated the notion of advance towards happiness or some other good. It is employed as if it were identical with natural selection, or transmutation, or any other mode of development, and it is even used when only growth is intended. But it is not a mere increase of bulk, nor is it restricted to any particular process, nor has it any special aim. It is a change from simplicity to complexity, from incoherence and indefiniteness to coherence and definiteness. Thus the nebular hypothesis requires the evolution of planetary bodies from incoherent fragments, which not merely come into relation with each other, but in the process become grouped together so that the nascent mass comes to consist of parts, becomes complex. The homogeneous protoplasm in which all organized beings commence shows when under favourable conditions first the elements of tissues; these are grouped into tissues, and the tissues are associated into organs. The 'indifferent' matter is differentiated in various degrees, and the animal and vegetable series show many grades of difference. Thus the Protamœba never reaches to the formation of tissues; the Hydra has tissues, but few organs; and, ascending higher in the series, the sharks, complex as is their organization, manifest a less thorough differentiation of their hard parts, which are chiefly cartilaginous, than do mammals, in which cartilage is subordinate to bone. But the evolution of the more complex from the more simple organisms does not necessarily, probably never does, form a linear series: thus of the protoplasm which represents the first stage of an

animal's existence part is set aside for one tissue, part for another; in the same way, on the theory of the origin of the many animal and vegetable forms from a common stock, some members of a group have manifested such modifications as render them permanently unlike their kindred, of whom the majority retain for a longer or shorter time their original characters. But the development of human society illustrates, probably better than any other, the salient points of evolution. The savage tribe is composed of units, among which one stands forth as leader or chief, but with this difference the tendency to evolution ends: the tribe is incoherent, since the individuals have no relations with each other. But if their surroundings alter, if they are compelled to migrate, or are invaded, and thereby are brought in contact with new wants and new sources of supply, what is known as division of labour indicates the first differentiation. The work formerly diffused among the units is concentrated upon one or more individuals, and thus the elements of combinations emerge. When, with the growth of the community, the combinations become more numerous, an essential feature of evolution is illustrated, namely, the transfer of movement from units to masses, and the interdependence of these masses on each other. The growth of a nation, that is, its numerical increase, is not necessary to its evolution; it may hasten the completion of the process, but its main effect is to make the results conspicuous by exhibiting them on a larger scale. The correlation of the physical forces gives that mutual relation of parts which separates growth from evolution. In geology evolution means not merely change in obedience to constant laws, which is all that the advocate of uniformity contends for, but change under the influence of laws whose operation varies with the conditions under which they act. The change of temperature with change of the earth's distance from the sun affects the whole animate and inanimate world: every change of matter, from the solid to the liquid, and thence to the gaseous state, is the use or liberation of force, and thus affects the conditions under which other matter exists and organized beings live. But evolution does not mean change of matter as well as of the relations of its parts: fresh matter is not essential to it, since the phenomena included under it are as a matter of fact rearrangements of that which exists. The dissolution of formed compounds is essential to evolution, and this dissolution is a change in which the compounds lose their definiteness; it is in fact a restoration of the constituents to the incoherent state, and the movements of the mass are transferred to the independent particles. Such are the essential facts regarding evolution, and it is plain that the phenomena are independent of any theory as to their cause. Evolution is a law whose operation is traceable throughout every department of nature; and when it is spoken of as a hypothesis something else is manifestly intended, some doctrine of transmutation or other scheme not intellectually approved by him who uses the phrase. Another now abandoned use of the term was its application to the development of the ovum, which was held to contain in itself the germs rather than the potentiality of all subsequent forms. Of this hypothesis the witty remark was the justest criticism, 'L'hypothèse d'emboîtement demande l'emboîtement d'un infini d'hypothèses.'

EVOLUTIONS, in tactics, are the movements of a troop, for practice, or in the face of the enemy. They comprehend the formation of columns, marches, &c. (See MANŒUVRE.) The movements of a fleet at sea are also called *evolutions*.

EVOLVENTS, in mathematics, curved lines formed by the evolution of curves.

EVORA (ancient *Ebora*), a town in Portugal, capital of the province of Alemtejo, on a height in the centre of a fertile plain, 80 miles east of Lisbon. It is an ancient place, the see of an archbishop, and famous for the defeat of the Moors by Gerard the Fearless in 1166. It is poorly built, and its walls, citadel, and forts are all in a ruinous state. Its most interesting objects are a magnificent Roman aqueduct, a large and handsome cathedral, a Gothic structure, founded in 1186, a college, and an ecclesiastical seminary. The manufactures are ironware and leather, and there is a large annual fair. Pop. 11,965.

EVREMOND, or EVREMONT. See ST. EVREMOND.

EVREUX (ancient *Civitas Eburovicum*), a town of France, capital of the department of Eure, in a fertile valley on the Iton, which branches so as to divide it into three parts, 57 miles W.N.W. of Paris. It is an ancient place, was sacked by the Normans in 892, and taken in 1119 by the English, who long retained possession of it. Its streets are narrow, but its houses well built. Its most remarkable objects are the cathedral, a very ancient but irregular Gothic structure, with a spire 256 feet high; the church and cloisters of the Abbey of St. Thaurin, an ancient and lofty clock-tower, a town-house, once the palace of the dukes of Bouillon, two theological seminaries, a college and normal school, a theatre, library, and botanic garden. The manufactures consist chiefly of bed-ticking, hosiery, and leather, and there are also bleacheries, dye-works, brick and tile works, and numerous flour-mills. The trade is chiefly in corn, cattle, seeds, and timber. Pop. 12,320.

EWALD, JOHN, one of the most original Danish poets of modern times, particularly distinguished as a tragic and elegiac poet, was born at Copenhagen in 1743, but was educated in Schleswig. The perusal of Robinson Crusoe took such a strong hold of him that he fled from home in search of a desert island. The runaway was captured before he had gone far. At the age of fifteen he was sent to finish his studies in the theology classes of the Copenhagen University. The constraint imposed on his inclinations, which were fixed on the military profession, now became intolerable to the young man; he ran away a second time, and enlisted in the Prussian service at Hamburg. But being compelled to join a regiment of artillery at Magdeburg, instead of being attached to the hussars, as he had been promised, he deserted the Prussian standard in the Seven Years' war, and entered the Austrian service, where he was not only better treated, but, having distinguished himself on several occasions, was promised promotion, on condition of embracing the Catholic religion. This Ewald refused; and, being bought off by his family, he returned to Copenhagen. He now began to apply himself seriously to theology. But a disappointment in love again interrupted his career; the world and life became odious to him, and he sank into despondency. He was then twenty-three years old, and was unconscious of the talent slumbering within him. An accident kindled the flame. On the death of Frederick V. of Denmark he was requested to compose an elegy; and the general admiration with which it was received roused the ambition of the young man, who now, encouraged by the Academy of Copenhagen, protected by Bernstorff and Karstens, and assisted with the advice of Klopstock, then residing in Copenhagen, made rapid progress in his new career, and soon became one of the most eminent lyric and tragic poets of his nation. His Death of Balder, the subject of which is taken from the northern mythology; and his Rolfkrage, a tragedy taken from the ancient history of Denmark, are works which, notwithstanding many defects, bear

the impress of true genius; and several of his odes and elegies are among the best that modern times have produced. He died in poverty, in 1781, scarcely thirty-eight years old. A beautiful edition of his poems appeared soon after his death, in four volumes.

EXANTHEMATA (eruptions), diseases of the skin, joined with fever, hence called *acute, hot* eruptions, to distinguish them from *chronic* eruptions, which are only incidentally accompanied with fever (called, in medical language, *impetigines*). They include the small-pox, measles, scarlet-fever, &c. Each has its peculiarities, relating to the manner of its origin, to the form and position of the eruptions, and to the continuance of the disorder.

EXARCHATE. When Narses, the general of Justinian, emperor of the East, had entirely subdued the Goths and their allies in Italy (552–554), Justinian formed the middle part of Italy into a province of the Eastern Empire, and gave the government of it to an officer called an *exarch*. Astolphus, king of the Lombards, conquered Ravenna and the whole exarchate (752); but Pepin, king of the Franks, deprived him of it in 755, and bestowed it on the pope, Stephen III. Among the modern Greeks an *exarch* is a deputy of the patriarch, who travels about in the provinces, and visits the bishops and churches.

EXCAMBION, in Scots law, the name given to the contract by which one piece of land is exchanged for another. By 6 and 7 William IV. cap. xlii. it is enacted that an heir of entail in possession may, without consent of any other heir, make excambion of a portion of the entailed estate for an equivalent in lands lying contiguous to the same, after giving due notice to the five heirs or substitutes of entail, or the whole if less than five. Excambion cannot be made of the principal mansion-house or offices, or the garden, park, home-farm, or policy of any entailed estate, nor of more than one-fourth in value of the heritages.

EX CATHEDRA (Latin, *ex*, from, and *cathedra*, from the Greek *kathedra*, chair), a phrase used in speaking of the solemn dictates or decisions of prelates, chiefly the popes, delivered in their pontifical capacity. Hence, in common language, the phrase is used for any decision, direction, order, &c., given with an air of official authority.

EXCELLENCY, a title first given to the Lombard kings, and afterwards assumed by several emperors of the West; for instance, Charlemagne, Conrad I., Frederick I., &c. It was afterwards transferred to the inferior princes, especially in Italy, until they also gave it up, after Pope Urban VIII., in 1630, had bestowed the title of *eminence* on the cardinals. The princes now assumed that of *highness;* the more readily because some ambassadors of the first rank at Rome had already adopted the title. Since that time the title of *excellency* has, by general use, become a title of office or service, in no case hereditary, or transferable from one member of a family to another, but always belonging to the office, and only borne, on the European continent, by ministers in actual service, by the highest court and military dignitaries, and by ambassadors and plenipotentiaries. Foreign ministers are addressed by the title of *your excellency*, by way of courtesy, even if they have no rank which entitles them to this distinction; but *chargés d'affaires* never receive this title. Governors of English colonies are also called *excellency*. In the United States the governor of Massachusetts is the only one who has the title of *excellency* by a constitutional provision. The president of the United States is sometimes spoken of in foreign papers as *his excellency the president.*

EXCHANGE, a place in large commercial towns where merchants, agents, bankers, brokers, and others concerned in business meet at certain times for the transaction of business. Meeting-places for commercial purposes existed at an early date in Genoa, Venice, and other Italian cities. The modern institution of exchanges dates from the sixteenth century. They originated in the important trading cities of Italy, Germany, and the Netherlands, from which last-named country they were introduced into England. Previous to the latter half of that century the London merchants used to meet without shelter in Lombard Street. Sir Richard Gresham, having seen the covered walks used for exchanges abroad, contemplated a similar building in London. The scheme was carried into effect by his son Sir Thomas Gresham, who contributed the cost of the erection, the citizens paying for the site alone. On January 23, 1570, the building was formally opened by Queen Elizabeth, and received the name of the Royal Exchange. It was destroyed by the great fire of 1666, and its successor, opened in 1669, shared a like fate in 1838. The foundation-stone of the present structure was laid in 1842 by Prince Albert, and was opened by Queen Victoria on New-year's Day, 1845. It is an imposing edifice, embellished with numerous statues. The area appropriated to the meetings of the merchants is 170 feet by 112, of which 111 feet by 53 is uncovered. Here the English, German, Greek, Mediterranean, and other foreign traders all have their appropriate places, and meet daily. On Thursdays and Fridays extra meetings for transactions in foreign bills of exchange take place previous to the regular meeting, which is attended by the principal bankers and merchants of London. The most celebrated continental exchanges are the *Bourses* of Paris and Amsterdam, the *Börse* of Hamburg, and the *Birza* of St. Petersburg, and in America the Merchants' Exchange in Wall Street, New York. Within a late period corn exchanges have been erected for the convenience of grain dealers in several towns of the United Kingdom.

EXCHANGE, in commerce, that species of transactions by which the debts of individuals residing at a distance are cancelled without the transmission of specie. Thus, suppose a merchant in London orders his agent in Glasgow to send him £100 worth of cotton goods, and that it is not convenient for the agent to commission goods of equal value from his London correspondent, the latter may, notwithstanding, be under no necessity of remitting cash to Glasgow in discharge of his debt. Among places having a considerable mutual intercourse, the debts due by each other are generally found to be about equal. The Glasgow agent does not therefore transmit the bill drawn by him on his correspondent for the value of the cottons, to London to be cashed, as he would have to bear the expense of getting the money sent him; but he gets its value from some other party in Glasgow who has a payment to make in London (say for tea), and who, unless he could procure such a bill, would have had to remit the amount of his debt in money. The bill on account of the cotton is therefore either drawn in favour of the party in London who furnished the tea, or it is drawn in favour of the tea-dealer in Glasgow and indorsed by him to the former, who in presenting to the purchaser of the cottons receives its value. This contrivance obviates the expense and risk both of transmitting money from London to pay the cottons and of money from Glasgow to pay the tea; and both accounts are settled without the intervention of a single farthing. The process of liquidating obligations arising between different nations does not differ essentially from those which regulate the traffic in bills of exchange between different towns of the same country; but it is affected by special circumstances to such an extent as to put the trade in foreign bills seemingly

into a different category from those of home circulation. When it is borne in mind that the trade in money, or securities representing the worth of money by expressing quantities of money, is liable in the fullest sense to competition, to the effect of supply and demand, and to other cognate economical forces, it will be easily seen that circumstances which tend to produce fluctuations in market rates will apply with the greatest significance to the trade in foreign bills, since a wider latitude is given in such securities for the influence of these exceptional events. When all the accounts of one country correspond in value with those of another, so that there is an even balance, the exchange will be at par, that is, the sum for which the bill is drawn in the one country will be the exact value of it in the other. But such a state of things can never exist in reality, and the rate of exchange is governed by the interposition of bills drawn on other countries where a similar inequality prevails, due to the fact that in these the inequality is reversed. Thus, in the trade between Italy and Britain the bills drawn on the latter country almost always amount to a larger sum than those drawn in Italy. The bill-brokers, however, by buying up the excess of the Italian bills on London and selling them in Holland and other countries indebted to England, prevent the *real* exchange from ever becoming greatly depressed. Fluctuations in the exchange have a tendency to correct themselves; they can never, in ordinary circumstances, for any lengthened period, *exceed* the expense of transmitting bullion from the debtor to the creditor country. When the exchange is favourable to one country it is also corrected by restricting exportation and facilitating importation; when unfavourable it produces the same effect by increasing exportation and diminishing importation. The true par forms the centre of these oscillations, and although the thousand circumstances which incessantly affect the state of debt and credit prevent the ordinary course of exchange from being almost ever precisely at par, its fluctuations are confined within narrow limits, and have a constant tendency to disappear.

EXCHANGE, DEED OF, in English law, an original common law conveyance for the mutual transfer of real estate. It takes place between two contracting parties only, although several individuals may be included in each party; and the parties must take an equal estate, as fee-simple for fee-simple, legal estate for legal estate, copyhold for copyhold of the same manor, and the like. An exchange is null if either party dies before entering, as actual entry by the parties themselves is essential. The General Inclosure Act (8 and 9 Vict. cap. cxviii.) provides for the allotment and award of any land to be inclosed in exchange for any other land within the same parish, and enables the commissioners to effect exchanges upon the application of the parties interested in the lands proposed to be exchanged by directing inquiries whether the proposed exchange would be beneficial to the owners, and if so, by framing under their hands and seals an order of exchange, with a plan of the lands to be given and taken in exchange. The act provides for the division of intermixed lands and for the exchange of inconvenient allotments for public purposes for more convenient land upon giving certain notices, and also empowers the commissioners to apportion the expenses.

EXCHANGES, LAW OF. See HEAT EXCHANGES (LAW OF).

EXCHEQUER, CHANCELLOR OF THE. See CHANCELLOR.

EXCHEQUER, COURT OF, an ancient court of record, established by William the Conqueror, and intended principally to order the revenues of the crown, and to recover the king's debts and duties. The court consists of two divisions, namely, the court of revenue, which ascertains and enforces the proprietary rights of the crown against subjects, and the common-law division, once subdivided into a court of equity and a court of common law, but by 5 Vict. cap. v. its equity jurisdiction was transferred to the court of chancery. It is one of the supreme courts of common law in England, and is said to derive its name from the chequered cloth, resembling a chess-board, which covers the table of the court, and on which, when certain of the accounts are made up, the sums are marked and scored with counters. The judges of this court are the chief-baron and five junior or *puiné* barons. From the court of exchequer an appeal lies in error to the court of exchequer chambers, where the judgments of each of the superior courts of common law (namely, the queen's-bench, common pleas, and exchequer), in all actions whatever, are subject to revision by the judges of the other two sitting collectively. The composition of this court therefore admits of three different combinations, consisting of any two of the courts below which were not parties to the judgment appealed against.

The Scotch court of exchequer, prior to the Union, was the king's revenue court. It was continued by the nineteenth article of the Treaty of Union until a new court should be established, which was effected by 6 Anne xxvi. By 19 and 20 Vict. cap. lvi. this court is now abolished, and the jurisdiction transferred to the Court of Session.

EXCHEQUER BILLS, bills of credit, or promissory bills, issued by authority of Parliament. They are for various sums, and bear interest (generally from 1½*d.* to 2½*d. per diem* on £100) according to the current rate at the time. In 1696, when first issued, they were drawn for sums varying from £100 to £5, and bore interest at the rate of 3*d.* per diem on £100. During the Napoleonic wars the interest was as high as 3½*d.* These bills pass from hand to hand as money, and are accepted by the treasury at par, or by government as payment of taxes. The advances of the Bank of England to government are made upon exchequer bills, and the daily transactions between the bank and government are carried on by this means. Notice of the time at which exchequer bills are to be paid up is given by public advertisements. The amount outstanding on March 31st, 1873, was £4,829,100.

EXCISE may be said to be an inland duty or impost laid on commodities consumed, or on the retail, which is the last stage before consumption, as an excise on coffee, soap, and candles, which a man consumes in his family. Many articles, however, are excised at the manufactories. As in few countries the definitions of *excise*, *impost*, *custom*, &c., are scientifically settled, it is almost impossible to give a satisfactory explanation of excise applicable to all countries. Excise is either general, extending to all commodities; or particular, levied only on certain articles of consumption. The latter sort was introduced into Saxony at the diet of Leipzig as early as 1438, and extended in 1440 at the diet of Grimma; but a perfect system of general excise was first devised in France, and thence introduced into Holland soon after it had assumed a republican form of government, into the state of Brandenburg under the reign of the Elector Frederick William the Great, and into Saxony in the beginning of the eighteenth century.

Excise duties were introduced into England by the Long Parliament in 1643, being then laid on the makers and vendors of ale, beer, cider, and perry. The royalists soon after followed the example of the republicans, both sides declaring that the excise should be continued no longer than the termination

of the war. But it was found too productive a source of revenue to be again relinquished; and when the nation had been accustomed to it for a few years the Parliament declared in 1649 that the 'impost of the excise was the most easy and indifferent levy that could be laid upon the people.' It was placed on a new footing at the Restoration; and notwithstanding Mr. Justice Blackstone says that 'from its first original to the present time its very name has been odious to the people of England' (Com. book i. cap. 3), it has continued progressively to gain ground, and is at this moment imposed on a variety of most important articles, and furnishes about two-sevenths of the entire public revenue of the kingdom. The excise duties imposed on leather, candles, beer, salt, glass, hops, paper, and other articles less important have been repealed. The revenue arising from excise in the year ending 31st March, 1873, amounted to £25,904,450, over £20,000,000 of which arose from spirit and malt duties.

The laws with respect to the general management of the excise were consolidated by the 7 and 8 Geo. IV. cap. lii., from which the following particulars are selected:—Four commissioners constitute a board. They are to be subject, in all things relating to their peculiar duty, to the orders of the treasury. They may appoint collectors and other subordinate officers, and give them such salaries and allowances as the treasury shall direct; but they are not allowed to increase the number of inferior officers without the permission and approval of the treasury. No member of the House of Commons can be a commissioner of excise. No officer of excise is to vote or interfere at any election of a member of Parliament, under pain of forfeiting £500, and being rendered incapable of ever holding any office or place of trust under his majesty. By 31 & 32 Vict. cap. lxxiii., however, the disabilities of revenue officers to vote were removed. No person holding any office of excise is to deal in any sort of goods subject to the excise laws. Any person bribing or offering to bribe any officer of excise shall forfeit £500; and every officer accepting such bribe, or doing, conniving at, or permitting any act or thing whereby any of the provisions of the excise laws may be evaded or broken, shall forfeit £500, and be declared incapable of ever after serving his majesty in any capacity whatever. But if any of the parties to such illegal transactions shall inform against the other, before any proceedings thereupon shall have been instituted, he shall be indemnified against the penalties and disabilities imposed for such offences. It is lawful for any officer to enter any building or other place used for carrying on any trade subject to the excise, either by night or by day (but if by night, in the presence of a constable or peace officer), to inspect the same, &c. And upon an officer making oath that he has cause to suspect that goods forfeited under the excise acts are deposited in any private house or place, two commissioners of excise, or one justice of the peace, may grant warrant to the officer to enter such house or place (if in the night, in the presence of a constable), to search for and seize such forfeited goods. Specimen books may be left by the officers on the premises of persons subject to the excise laws; and any one who shall remove or deface such books shall be liable to a penalty of £200. Goods fraudulently removed or secreted, in order to avoid the duty, to be forfeited. The subsequent acts relating to general management are 4 and 5 Will. IV. cap. li., 4 and 5 Vict. cap. xx., 10 and 11 Vict. cap. xlii., 12 and 13 Vict. cap. i. By the last the boards of commissioners of excise and stamps and taxes, are consolidated as 'Commissioners of Inland Revenues.'

EXCLUSION, BILL OF, a bill introduced into the British Parliament during the reign of Charles II. for the purpose of excluding the Duke of York, he being a Papist, from the throne.

EXCOMMUNICATION, the excluding of a person from a society, and depriving him of its fellowship; more particularly the exclusion of a Christian from the church. Some kind of excommunication has existed wherever societies have existed—secular, spiritual, literary, &c. The Jews practised excommunication, namely, an exclusion from communion in the benefits of religious worship with the people. In the early Christian church excommunication was exercised by the whole community. By degrees the right of excommunication became confined to the bishops; and both in the Greek and Roman Catholic churches the subject of excommunication became more and more distinctly settled by treaties and decrees. A person excommunicated from the Roman Catholic Church is put out of the communion of the faithful; namely, he cannot hear mass, partake of the Lord's supper, nor attend public prayers, &c.; no person is allowed to have any communication with him except in case of necessity. (Political relations, for instance, may allow such communication; as Francis I. of France always transacted business with the excommunicated Henry VIII. of England.) Since the time of Pope Gregory IX. there have been two kinds of excommunication in the Roman Church — the greater and the less. The former excludes the person from all communion with the faithful, and from the privilege of Christian burial. Subjects were absolved from allegiance to their sovereign, who lay under the greater excommunication, nay, were forbidden to obey him. But, in more modern times, many Catholic ecclesiastical writers have maintained that, as an excommunicated private person is not prohibited by civil governments from managing his worldly affairs, so the excommunication of a prince ought not to have any influence on matters of political administration. Besides, the spirit of the age is such as not to allow an excommunication to have the same influence on the relations between princes and people as in the middle ages. At that time the pope excommunicated even whole cities, provinces, and countries. An excommunication was then considered the heaviest visitation which the country could suffer. All religious services ceased; there was no regular burial, no ringing of the bells, &c. Relics and crucifixes, and all other things which had been full of religious comfort to the believer, were supposed to lose their spiritual power. Gregory V. first pronounced such an excommunication against France in 998, because King Robert would not separate himself from his lawful wife Bertha, who was related to him in the fourth degree. Robert was at last obliged to yield. Still more important was the excommunication issued against England by Innocent III., because King John refused the payment of the tribute called Peter's-pence, and the acknowledgment of a right in the pope to confer the investiture of the English bishoprics. The king was obliged to yield, and received back his kingdom as a Papal fief. No country, however, has suffered more from excommunications or interdicts, as these general excommunications of a whole country are called, than Germany. Many of the emperors were excommunicated, and many revolutions produced in consequence. The latest examples of sovereigns excommunicated are Napoleon I., in 1809, and Victor Emmanuel, in 1860. The lesser excommunication has two effects, namely, exclusion from the sacraments and from ecclesiastical offices.

Excommunication cannot be said to have been abolished by the Reformation. Luther says, for instance, that a person not receiving the Lord's supper

during a whole year should be separated from the faithful; nothing, however, of the severity of the greater excommunication, and the *anathema*, is retained. In the states of Germany, however, excommunication is nowhere practised at the present time among Protestants. It would be thought an undue exercise of power by the clergy, especially as the Protestant sovereigns declare themselves to be the head of the church in their respective countries, and would consider the punishment of their subjects by the clergy under them as an infringement of their prerogatives. In the Church of England both the less and the greater excommunication are recognized, but since 53 Geo. III. cap. cxxvii. have had no civil consequences of any moment, and may now be considered to have no practical influence except in ecclesiastical matters. In Scotland immoral conduct among the members of most congregations may produce exclusion from church privileges; but this excommunication is not considered as affecting the spiritual welfare of the individual.

The Catholics use the phrase *fulminating an excommunication*, to signify the solemn pronouncing of an excommunication after several admonitions. The ceremonies attending such fulmination are terrible, and do not seem to have been used before the eleventh century. The excommunication pronounced in this way is generally called *anathema*.

EXE (Latin, *Exa*, *Icta*), a river, England, which rises in Exmoor, in the county of Somerset, and after a southerly course of about 50 miles, falls into the English Channel at Exmouth, by an estuary navigable for 8 miles to Topsham. Its chief tributaries are the Yeo and Clist. The principal places on its banks are, Exeter, Bampton, and Tiverton.

EXECUTION, in law, is a judicial writ grounded on a judgment of the court, by which the execution is issued, and is granted for the purpose of carrying the judgment into effect, being an order in the name of the supreme power of the state, or the executive branch of the government, attested by the court to the sheriff, marshal, or other officer to whom it is directed, to cause the judgment of the court to be executed; as that a debt shall be levied against one party in favour of another; or that a punishment shall be inflicted, which has been awarded after due trial and conviction of the accused. Execution is granted by a court only upon the judgments given by the same court, not upon those pronounced by another; for where satisfaction of a judgment given by one court is sought in another, a trial must be had in such other, and a new judgment there given, on which execution issues. Executions are of various descriptions, according to the kind of satisfaction ordered, as a *capias ad satisfaciendum*, or an arrest for giving satisfaction, by which the sheriff, &c., is ordered to arrest and imprison the party against which it is issued, until he satisfies a certain debt declared by the judgment to be due, or is otherwise discharged by order of law; a *fieri facias*, by which it is ordered that the amount of the debt be made of the goods and chattels of the party against which the execution is issued, for the satisfaction of the same; a *levari facias*, by which the officer is ordered to cause satisfaction of the judgment by a levy on the goods or lands of the debtor; an *elegit*, by which the judgment is ordered to be satisfied by setting off all the goods and half the lands of the debtor, by appraisement to the creditor in satisfaction of his debt, whereas, by the *levari facias*, the goods of the debtor are sold by the officer, and the proceeds in money are paid over to the creditor; and the *statute merchant* or *staple*, in England, whereby execution issues upon an acknowledgment by the debtor, with certain forms before some magistrate, and a record thereof, that he is indebted in a certain amount to the creditor; this is, in fact, obtaining a judgment for the debt before it is due, so that, on its becoming due, execution issues immediately without trial. The order issuing to an officer to execute a judgment given on an indictment varies according to the penalty inflicted by the law for the crime or delinquency of which the party is convicted.

EXECUTION. See CAPITAL PUNISHMENT.

EXECUTIONER, the official who carries into effect a sentence of death, or inflicts capital punishment in pursuance of a legal warrant. In England it is the province of the sheriff to execute the extreme sentence of the law, but in practice the disagreeable duty is performed in his presence by an officer retained for this purpose. In Scotland the duty devolves upon the civic magistracy, but the strict letter of the law is avoided as in England by the attendance of a magistrate to witness the proceedings. Several executioners have become famous from their names being dragged into literature; such as Richard Brandon, the supposed headsman of Charles I.; Jack Ketch, commemorated by Dryden (Epilogue to the Duke of Guise), whose name, to quote Macaulay, has, during a century and a half, been vulgarly given to all who have succeeded him (in London) in that odious office. In the good old times almost every considerable town or county had its special executioner, but it is found that now-a-days one man is able easily to overtake the whole business of the kingdom in this department.

EXECUTOR, in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the English law, appoint any person of sound mind and discretion, though under some legal disabilities, as to contracting and transacting business in general, such as a married woman, or a minor. The duties of executors and of administrators are, in general, the same; the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate; and often an administrator is appointed to administer upon an estate under a will, as where the testator does not name an executor, or where the executor named declines, or where the executor or administrator first assuming the trust has died, or is discharged by the court. Where administration on the estate has once been granted and commenced, and before it is completed, a new appointment is necessary, the person so appointed is called an *administrator de bonis non*, 'with the will annexed,' if there be a will. The administrator, with the will annexed, assumes the duties that would have belonged to the executor if one had been appointed, or if the one appointed had acted, or had continued to act. Though a testator is at liberty to appoint any person to be his executor, with some few exceptions, the judge of probate is restricted, in the appointment of an administrator, whether it be the one on an estate of a person dying intestate, or 'with the will annexed,' and whether it be the one originally appointed or the one appointed *de bonis non;* for the widow and nearest of kin to the testator have a right to the appointment, unless they are under some legal disability. The statutes more generally provide that the nearest of kin of the age of twenty-one shall have the administration, either jointly with the widow, if there be one, or on her declining, or on there being some legal objection to her appointment. By other statutes on this subject it is left to the discretion of the judge of probate, of the orphan's court, or of the magistrate, whoever he be, having this jurisdiction, to appoint either the widow or the next of kin. The principal creditors

of the deceased are next entitled to this appointment. But a liberal discretion is generally vested in the magistrate as to this appointment. The same judge who appoints the administrator has the power of revoking the appointment.

An executor *de son tort*, that is, an executor of his own wrong, is one who meddles with the administration of the goods of a person deceased without any authority so to do, and he is accordingly answerable to the rightful executor, or administrator, when one is appointed. It is the duty of an executor or administrator, after the will is proved, if the estate is to be administered under a will, to give notice of his appointment, make an inventory of the estate, and return it to the probate office or court; to take care of the personal property of the deceased, and see that it is not wasted; to collect the debts due to the estate, and, finally, to distribute the effects or their proceeds among the creditors until their demands are paid, and then among the heirs and legatees, according to the directions of the will of the deceased, or according to the dispositions of the law, in case of its being the estate of a person dying intestate, or what is called, in the civil law, an estate *ab intestato*. In collecting the effects and debts, and so in investing the proceeds pending the administration, the executor or administrator, for the most part, acts according to his own discretion; but in making a distribution of them among the heirs or legatees he is particularly directed by the judge of probate. In the former case he accordingly acts at his peril, and is liable, as are also his sureties, for his managing the estate with proper discretion; but in distributing the effects and proceeds he acts under a judicial decree, and so is secure from any personal liability. In Scotland an executor to a will is called a *testamentary* executor, in contradistinction to the next of kin, who are called executors; an executor appointed by will is styled executor *nominate*, and by authority of the court executor *dative*.

EXEGESIS, the interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation may be called *exegetics;* though it is also designated by another name, *hermeneutics*. As the sacred books were composed by authors of a distant age and country and in foreign languages, it is evident that, in order to understand them, it is necessary to have not only a profound knowledge of the languages, but also a mass of historical, geographical, and antiquarian knowledge; and as the knowledge of Christian doctrine must be drawn from the Scriptures, it follows that the whole study of theology must proceed from exegesis. The most celebrated exegetic authors among the church fathers were Origen, Chrysostom, Theodoret, Diodorus of Tarsus, and Jerome. In the middle ages, when people confined themselves almost exclusively to the Vulgate or Latin translation, which was in common use, and most of the theologians were ignorant of the original languages, exegesis was very much neglected. But the study was revived by the Reformation, and within the last century there have been a multitude of eminent exegesists, particularly in the Protestant Church, and especially in Germany.

EXETER (Latin, *Isca*, *Exonia*, *Uxela*), a city, seaport, and parliamentary and municipal borough of England, in the county of Devon, on the left bank of the Exe, 10 miles north-west from its outlet in the English Channel, and on a branch of the Great Western Railway. It is pleasantly situated on the summit and slopes of an acclivity rising from the river, over which, at the west entrance to the city, is a handsome stone bridge. Two principal streets cross each other at right angles, from which a number of smaller diverge. Though still presenting many indications of antiquity, the city can now boast of as handsome squares, terraces, streets, and houses, all of modern erection, as any other in the kingdom. The principal object of interest is the cathedral, a noble edifice of high antiquity. It is cruciform, 408 feet in length, and consists of a nave, with two side aisles; two short transepts formed out of two heavy Norman towers, each 130 feet in height; a choir of the same width as the nave, and 128 feet in length; ten chapels or oratories, and a chapter-house. The west front is richly decorated, presenting one of the most picturesque façades of any building in the kingdom, perhaps in Europe. The interior, now restored by Sir G. Gilbert Scott, is magnificent. Other architectural antiquities are the remains of the castle of Rougemont, portions of the ancient city walls of Athelstan, Norman work in some of the churches, and the noble guild-hall, tastefully restored. The finest modern building is St. Michael's church. Among the numerous educational establishments is a free grammar-school, founded by the citizens in the time of Charles I., in which the sons of freemen are instructed gratuitously. It has sixteen exhibitions to either of the Universities of Oxford or Cambridge. The Exeter Diocesan Training College is in the suburb of Heavitree. The charitable institutions of various kinds are numerous. They comprise the Devon and Exeter Hospital; many almshouses; a dispensary, a lunatic asylum, a deaf and dumb institution, a penitentiary, an eye infirmary, a lying-in charity, a humane society, a stranger's friend society, &c. The principal scientific and literary institutions are,—the Devon and Exeter Institution for the Promotion of Science, Literature, and the Arts, established in 1817, and possessing a valuable library; the athenæum, a literary institution, established in 1835; and the Albert Memorial Museum, completed in 1868, making provision for the local museum, school of art, and free library. Exeter is not a manufacturing town, its woollen trade, once one of the largest in England, being extinct; but it has iron foundries, manufactories of agricultural implements, paper-mills, corn-mills, and tanneries. Glove-making and lace-making are also carried on. By means of a canal, 5 miles in length and 15 feet in depth, vessels of 400 tons can reach the city, and there is a large floating basin. The Exe itself is not navigable to the city. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, by whom it was called *Isca Damnoniorum*. It is spoken of by this name both by Antoninus and Ptolemy. A number of coins, small bronze statues, some tesselated pavements, and other Roman antiquities, have been found in the immediate vicinity of the city, showing that it had been an important Roman station. The number of its religious establishments was at one time so great that the Saxons called it Monktown The city is known to have been represented in Parliament as early as the time of Edward I. Pop. municip. bor. 35,650; parl. bor. 44,226.

EXETER COLLEGE, Oxford. This college, originally called Stapledon Hall, was founded by Walter de Stapledon, Bishop of Exeter, sometime Lord High-treasurer of England, who removed to this place his scholars from Hart Hall, and made a foundation for a rector and twelve fellows. In 1404 Edmund Stafford, bishop of Exeter, added two fellowships and obtained leave to give the college its present name. In 1565 Sir William Petre, secretary of state, added eight; in 1636 Charles I. annexed one for the islands of Jersey and Guernsey; and lastly Mrs. Shiers left certain rents in 1770, out of which two fellowships were founded. Under the authority of 17 and 18 Vict. cap. lxxxi. the fellow-

ships (a number of which were appropriated to various archdeaconries or counties) were reduced from twenty-five to fifteen, and are now open without restriction in respect of birth. From the revenues of eight suppressed fellowships twenty-two scholarships were founded, ten of which are open, ten (called Stapledon scholarships) are limited to persons born or educated in the diocese of Exeter, and two to persons born in any of the Channel Islands, or educated at Victoria College, Jersey, or Elizabeth College, Guernsey. There are twenty exhibitions attached to the college, nine of which are in its immediate gift.

EXETER HALL, a large building on the north side of the Strand, opened in 1831. It is 131 feet by 76, and 45 feet high, and is capable of containing over 3000 persons. In it the 'May Meetings' of the several religious societies are held. It is let chiefly for religious purposes and concerts, generally of a sacred nature.

EXHAUSTION. The ancient geometers were entirely unacquainted with the facilities of the higher analysis. The process which they used instead of it, in the comparison of curvilinear figures, curved surfaces, and round bodies, consisted in bringing the magnitudes into relation with others, to which, it is true, they could not be made entirely equal, but yet so nearly equal that the difference is smaller than any assignable quantity. This was called the *process* of *exhaustion*. (See Maclaurin, On Fluxions, the introduction of his work.) The differential calculus furnishes a much surer and speedier method for attaining the object.

EXHAUSTIONS, METHOD OF. The ancient geometricians employed the method of exhaustion for determining the areas of curves, and for the solution of similar problems. The method consists in comparing the magnitude to be determined with rectilinear magnitudes; thus the area of a curve with the area of a polygon constructed so as to be comparable with the curve in question. The use of the method is exemplified in the second proposition of Euclid's Twelfth Book, in which it is shown that the areas of circles are proportional to the squares of their diameters. This is proved by successively inscribing in the circles regular polygons of 4, 8, 16, &c., sides, thus tending to exhaust the area of the circles; it is then shown that by inscribing a polygon of a sufficient number of sides in the circle, the area of the polygon may be made to differ from that of the circle by less than any assignable quantity: and since the areas of similar regular polygons inscribed in circles are to each other as the squares of their diagonals, it is argued that the areas of the circles themselves bear the same ratio. The method was applied with all the rigorous logical exactness for which the Greek geometricians are so famous.

EXHIBITION, a benefaction settled for the maintenance of scholars in the universities of England and America. In Scotland such scholarships are called *bursaries*.

EXHIBITION, INDUSTRIAL. The promotion of trade and manufactures by means of collections of works of industry and art has no claim to the merit of novelty. In modern times, however, the idea has been more systematically carried out, and was probably suggested by the beneficial effects produced by two causes of a like nature—the galleries of rare productions of art or nature, collected by the wealthy and educated to please the eye and correct the taste, and from the exposure for sale of ornamental and useful articles in the stores of individuals, and more particularly in the great fairs and bazaars which in former times were the principal features of commercial enterprise. These two circumstances operated powerfully upon each other, and while the wares of the manufacturer derived a higher tone of beauty and refinement from the exquisite forms and colours in the collections of the nobles, the latter received fresh accessions of artistic productions from the merchant, and demanded from the artisans articles displaying higher intellect and more cultivated taste. The beneficial effect thus casually derived from the exposure of works could not escape the notice of reflecting observers. In England this knowledge was brought to practical purposes more than a century ago, when the Society of Arts in 1756–57 not only offered prizes for specimens of manufactures, as carpets, tapestry, porcelain, &c., but exhibited the works of the competitors. In France an exhibition embracing all kinds of manufactures was held in the year 1798, and another under the consulate of Bonaparte in 1802, and the gratifying results attained led to the idea of holding them every three years, which was carried out as far as the political troubles of the country would allow. In the British Islands exhibitions of a more or less local nature had been held in Dublin, Manchester, Liverpool, and Birmingham, and annually in London in the premises of the Society of Arts. All these had been generally successful, but the necessity of having them on a universal scale had become with some a fixed idea. It was first brought fairly before the public in 1848 by Prince Albert, then president of the Society of Arts. In 1849 it began to take a tangible shape. It was resolved to meet all the expenses incidental to the exhibition by voluntary subscription, and it was at last determined by government to issue a royal commission, which was gazetted 3d January, 1850. To enable the commissioners to enter into contracts and otherwise incur obligations subscriptions were procured to a guarantee fund, the queen leading the list with £1000. A vast structure of iron and glass, the design of Joseph Paxton, was erected in an incredibly short space of time in Hyde Park, London, and was opened by her majesty on the 1st of May, 1851. The extreme length of the building was 1851 feet, the width 408, and the height about 64 feet. The entire area was about 19 acres. In the ground-floor and galleries there were about 8 miles of tables set apart for the exhibitors. The articles sent for exhibition were divided into four great sections:—Raw Materials, Machinery, Manufactures, and Fine Arts. The number of exhibitors appears to have been about 15,000. The exhibition remained open until the 11th October, and the number of visitors during the 144 days amounted to about 6,170,000. The money drawn for admission amounted to £505,107, and after all expenses were defrayed there was a balance of £150,000 left over. Exhibitors and visitors from all places of the world assembled in the magnificent crystal palace. When the exhibition was over the building was taken down, and a great part of the material was used in the Sydenham Crystal Palace. From the immense success of the undertaking the local and national exhibitions of Dublin and New York in 1853 and of Munich in 1854 were encouraged to redoubled efforts; and the French nation in 1855 opened its first Exposition Universelle. The main building was an imposing structure of white stone and of classic architecture, the interior completed with wrought and cast iron, and with glazed vaulting. Connected with the main building was a long and straight annèxe containing the exhibition of raw materials, machinery in motion, &c. Another annèxe, contiguous to, but not connected with these, was dedicated to the fine arts of the civilized world. The buildings were erected in the Champs Elysées, and covered about 24 acres. There were in all about 24,000 exhibitors, and the contents were pronounced greatly in advance of those exhibited in London in

1851. It was said that the continental manufacturer had taken lessons from the British exhibition which we ourselves had failed in fully profiting by, and so exhibited a vast improvement in works in which we considered ourselves unrivalled. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. It occupied a vast brick building, lighted by a roof and two immense cupolas of glass, designed by Captain Fowke, R.E., and erected in the garden of the Horticultural Society at South Kensington. The space covered was about 17 acres. There were 26,348 exhibitors in the industrial division, of whom 8487 were British, and in the fine art division 2305, of whom 990 were British. The aggregate number of visitors from 1st May to 31st October was 6,211,103, giving an average of 36,328 per day. The money taken for admission amounted to £328,858, and the entire cost of the undertaking to £321,000. The productions, which came from the extremest parts of the globe, were divided into forty classes, and included manufactures of all kinds—machinery, chemical products, railway plant, and ordinary vehicles, animal and vegetable products used in food or manufacture, architecture, painting, sculpture, engraving, &c. &c. This exhibition was also eminently successful, and enabled the public to judge of the progress or shortcomings of our home manufacture and art as compared with others. In 1865 a rather important exhibition was held in Dublin, which was successful in all respects but one—it was a pecuniary failure. The second French International Exhibition, the most extensive the world has yet seen, was opened on the 1st April, 1867, and closed on the 3d November. It was a rather unsightly building, deserving the descriptive name of gasometer given it by the Parisians themselves, was erected on the marshy Champ de Mars, covering about 37 acres, and contained the works of nearly 50,000 exhibitors. The building was of an elliptical form, and was divided into twelve concentric circles, with a small open garden in the centre. The outer circle was devoted to machinery of all kinds; then followed metallurgy, chemistry, dyeing, &c.; next came textile materials, clothing, furniture, jewelry, plate, porcelain, &c.; then matters relating to education; then the collection of fine arts; and, lastly, an archæological collection from each country, showing the rise and progress of industrial art. Back to back with the outer circle were the restaurants, and in the park surrounding the building were shown examples of domestic and palatial architecture of most nations of the world, and even the tents of some of the wandering tribes. Beasts of burden of the various countries were also shown, as well as civil and military erections of general importance. On the 1st of May, 1871, the first of the British annual international exhibitions of fine arts and industry was opened by the Prince of Wales. The buildings, situated on the east and west side of the Horticultural Society's gardens, are 1100 feet long on the ground-floor, and on the upper floor 600 feet. The width throughout is 30 feet, and the height of the two floors 60 feet. The buildings are in the decorated Italian style, with mouldings, cornices, columns, and courses in buff coloured terra-cotta. The main part of the structure is of red Fareham bricks. The total number of visitors from May to September was 1,142,154, and the success in a commercial sense was complete. On the 1st May, 1873, the first Austrian international exhibition was opened by the Emperor Franz Josef with great pomp and ceremony. The building is situated in the Prater, or, as it may be called, the park of Vienna, and is 2940 feet in length, with an average breadth of 570 feet. In the centre rises the vast rotunda, 354 feet in diameter and 250 feet high. On each side of the rotunda extend two immense naves, each 1030 feet in length, intersected at regular intervals by eight transverse galleries 240 feet and upwards in length, 50 feet wide, and 40 feet high. The machinery hall was upwards of half a mile in length, with a width of 150 feet. The outbreak of cholera in the Austrian capital interfered greatly with the success of the exhibition, which was shut on the 2d November.

EXILE, a punishment by which a person is compelled to leave the city, province, or the country, where he has previously resided. It amounts, therefore, to a civil excommunication or political proscription. It is a punishment for state criminals. The ancient republics sometimes exiled men on mere suspicion that they might become dangerous to republican liberty (by the ostracism). Many anticipated the sentence of the judges and went into voluntary exile. It does not often happen, at present, that real criminals are exiled, as it is felt to be unjust for one state to let loose offenders upon its neighbours. But it sometimes happens that persons convicted of minor offences are pardoned, on condition of leaving a county or district.

EXMOOR, a wild and hilly district in the extreme south-west of Somersetshire, extending also into Devonshire. It was formerly a forest, but, with exception of a considerable portion lately taken into cultivation, it is now mostly heath and marsh. It consists of ranges of hills of considerable elevation (the loftiest being Dunkerry Beacon, 1668 feet), and in the time of the Druids was a favourite spot for the celebration of their religious rites. Since 1851 Exmoor has become an iron-mining district.

EXMOUTH, a small town, England, in the county of Devon, 10 miles S.S.E. of Exeter, on the east side of the entrance to the estuary of the Exe, picturesquely situated in an opening of the cliffs which line the shore, and forming one of the handsomest and most fashionable sea-bathing places on the south coast of Devonshire. In the lower and older parts of the town the streets are narrow, and the houses irregularly built; but the modern portions are composed mostly of terraces surmounted by good houses, mansions of considerable size, and detached villas. There are numerous pleasant promenades, one of which is tastefully planted with trees, and commands a beautiful view of the opposite shores of the estuary. Below the town is a gradually sloping sandy beach, well adapted for bathing. A considerable number of the male population are employed in fishing, and many females are engaged in lace-making. Exmouth is said to have been one of the principal ports of the county in the reign of Edward III., although it had subsequently dwindled down to a mere fishing hamlet. It has a branch of the London and South-Western Railway from Exeter, and docks have lately been constructed. The South Devon Railway also passes close by the estuary of the Exe, on the opposite or west side. Pop. 5614.

EXMOUTH, Edward Pellew, Viscount, a distinguished naval officer, born on the 19th April, 1757. He went to sea at the age of thirteen, the ship in which he began his career being the *Juno* frigate, and his first voyage was to the Falkland Islands. He was not engaged in active service till 1776, on the breaking out of the American war, when, being sent out as midshipman in the *Blonde* frigate to Lake Champlain, he greatly distinguished himself in the course of that and the following year. On the surrender of the British force, after the battle of Saratoga, he returned on his parole to England, and was soon after appointed first lieutenant of the *Apollo*

frigate, under Captain Pownoll. In the midst of an action fought in the spring of 1780 the captain fell wounded in Lieutenant Pellew's arms, who thereupon assumed the command of the ship, and soon compelled the enemy to take safety in flight. For his conduct on this occasion he was promoted to the command of the *Hazard* sloop of war, from which in March, 1782, he was removed to the *Pelican*. A few months after he was raised by Admiral Keppel to the rank of post captain for a very spirited attack near the Bass Rock in the Frith of Forth on three of the enemy's privateers, all of which he drove on shore. On the breaking out of the war of 1793 he was appointed to the command of the frigate *La Nymphe*, of thirty-six guns, in which he sailed from Falmouth on the 17th June, and the next day captured the French ship *La Cléopatre*, after a sharp struggle. For this achievement he received the honour of knighthood. Twice, when captain of the *Winchelsea* frigate, his heroic spirit was signally displayed by his leaping from the deck, and thus saving two of his drowning sailors. A more conspicuous example of this noble feeling was shown on the 26th January, 1796, when, by his great personal exertions, he preserved the crew and passengers of the *Dutton* transport, which, crowded with troops and their families, proceeding on the expedition to the West Indies, was driven on the rocks under the citadel at Plymouth. All the officers had left the vessel, and Sir Edward caused himself to be hauled on board with a rope, established order, and did not leave the ship until every soul was saved. From this time till the peace in 1802 Sir Edward was employed in active service, and shared largely in the success which attended the naval arms of his country. On coming home after the peace he was returned to Parliament as member for Barnstaple. The resumption of hostilities, however, soon called him again abroad. In 1804 he was sent to take the chief command on the East India station, in the *Culloden*, of seventy-four guns; and here he remained till 1809, when he had attained the rank of vice-admiral. A few months after his return to England he was again sent out as commander-in-chief of the fleet then blockading the Scheldt, and assisted in various operations of importance till the peace of 1814. Among the promotions which were made on that occasion Admiral Pellew was elevated to the peerage by the title of Baron Exmouth, with a pension of £2000 per annum. He also received the riband of the Bath, and a year after the grand cross of that order. In 1816 he proceeded to Algiers in command of a combined fleet of twenty-five English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had violated. He bombarded the city for seven hours, and inflicted such immense damage, destroying all the Algerine fleet and many of the public buildings, that the dey consented to every demand. Twelve hundred Christian slaves were by this exploit restored to liberty. The dignity of viscount was the well-merited reward which Lord Exmouth received for this important service. In 1821 he retired into private life, passing the greater part of his time at his beautiful residence at Teignmouth, where he died on the 23d of January, 1833.

EXODUS, the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book, though not embracing such a variety of incidents as Genesis, are of a more diversified character, being not only historical, but also, and in a greater part, legislative. The subject-matter, arranged according to historical order, forms three divisions: 1. The condition of Israel in Egypt, and the preparations for their departure (ch. i.–xii. 36). 2. The march from Rameses to Mount Sinai (ch. xii. 37–xix. 2). 3. The abode in the desert and the promulgation of the Sinaitic Law (ch. xix. 3–xl.) Various arguments against the credibility and authenticity of the book have been given to the public; we can only mention one or two. By adhering to the scriptural chronology a longer period than 215 years cannot be given as the residence of the Israelites in Egypt, it is therefore maintained that the 'threescore and ten souls' who accompanied Jacob to Egypt could not in that time have increased to about 2,500,000, which is calculated to be the total of a population embracing '600,000 men, besides women and children.' It is also maintained that there are traces of two different writers in the book, the Elohist and the Jehovist. Among the writers holding these views we may mention Von Lengerke, De Wette, Knobel, and Bishop Colenso. They have been ably replied to by Hengstenberg, Hävernick, and others of less note.

EXOGENOUS PLANTS. See BOTANY.

EXORCISM. An opinion prevailed in the ancient church, that certain persons, those particularly who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism*. There were even certain men who made this a regular profession, and were called *exorcists*. In the third century an idea began to prevail that heathens and heretics were possessed by demons, and hence exorcism was joined with the act of baptism. From a supposed accordance with the doctrine of original sin, as explained by St. Augustine, exorcism was introduced in the baptism of infants. Luther allowed the custom to be retained; the Calvinistic Church early discarded it; many of the Lutheran clergy, even in the sixteenth century, also disapproved of it. It continued, however, in the Lutheran Church till modern times. It is now almost universally done away with among Protestants. The Catholic Church has ordinary exorcisms, as those used in baptism and in the benediction of the water; and extraordinary ones, those which are used to deliver possessed persons, to abate storms, to kill obnoxious animals, as the vermin which destroy the fruits of the earth. It is by no means, however, an idea which arose in the Christian church. All the ancient pagans, and also the Jews, acknowledged the efficacy of exorcism.

EXORCIST. The members of one of the lower orders of Catholic clergy are called by this name.

EXOSMOSE. See OSMOSE.

EXOTERIC. See ESOTERIC.

EXOTIC, an appellation for the produce of foreign countries. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised, and therefore can be preserved for the most part only in green-houses. Exotic plants of the hot climates are very numerous in this country, and require the utmost attention of the gardener.

EXPANSION, in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. (See HEAT.) This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of solid bodies is determined by the pyrometer, and that of fluids by the thermometer. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of

temperature. Water furnishes us with the most remarkable instance of this kind. Its maximum of density corresponds with 39°·2 of Fahrenheit's thermometer. This fact is not only curious in itself, but is also of the utmost importance in the economy of nature. When the surface of rivers and lakes is cooled, the superior layer of water sinks, and warmer water from below takes its place till the whole mass is cooled to 40°. After this the circulation ceases, and ice is formed only on the top. Any further cooling that takes place goes to produce more and more ice at the surface, and it is seldom that the temperature near the bottom of a lake or sea of any considerable depth falls sensibly below the maximum density point. Animal life would not, under other circumstances, be preserved during the cold of winter. The maximum density point of sea water is considerably lower than that of fresh water, and varies with the quantities of the salts contained in it. The expansion of water is about the same for any number of degrees above or below the maximum density point. Thus, if we heat water 5° above 39°·2, it occupies the same bulk as it does when cooled down to 5° below 39°·2: and the density of water at 32° and at 53° is very nearly the same. The prodigious force with which water expands in the act of freezing is shown by glass bottles filled with water, which are commonly broken in pieces when the water freezes. A brass globe, whose cavity is an inch in diameter, may be burst by filling it with water and freezing it; and the force necessary for this effect is 27,720 lbs. weight. The expansive force of freezing water may be explained by supposing it the consequence of a tendency which water in consolidating is observed to have to arrange its particles in one determinate manner, so as to form prismatic crystals, crossing each other at angles of 60° and 120°. The force with which they arrange themselves in this manner must be enormous, since it enables small quantities of water to overcome so great mechanical pressures. This observation is conspicuously illustrated by observing the crystals of ice on a piece of water exposed to the action of the air in frosty weather; or upon a pane of glass in a window of a room without a fire at the same season. Various methods have been tried to ascertain the specific gravity of ice at 32°; that which succeeded best was to dilute spirits of wine with water till a mass of solid ice put into it remained in any part of the liquid without either sinking or rising. The specific gravity of such a liquid is 0·92, which, of course, is the specific gravity of ice, supposing the specific gravity of water at 60° to be 1. This is an expansion much greater than water experiences even when heated to 212°, its boiling-point. We see from this that water at the instant of solidification receives a sudden and considerable augmentation of bulk.

EX PARTE, a law Latin term, meaning literally, 'all from one side,' and applied to evidence or pleadings, which, being untested as yet, is to be viewed with doubt or distrust. A commission *ex parte* in chancery is that which is taken out and executed by one party alone, the other refusing or neglecting to join.

EXPECTORANTS, in pharmacy, medicines which promote expectoration. Such are the stimulating gums and resins, squills, &c.

EXPECTORATION, the act of evacuating, or bringing up phlegm, or other matters, out of the trachea and lungs, by coughing, &c.

EXPENSES, or COSTS OF SUIT (in Scotland), are terms applied to the charges exigible from a party to an action, as court dues, fees to counsel and agents, and other expenses incurred in carrying on the action. The pursuer of an action at law in Scotland, in addition to demanding payment of the sum claimed, or performance of the stated obligation, almost invariably asks the court to pronounce decree in his favour for the expense of the necessary proceedings taken or to be taken. The defender on his part usually demands the expense attending his defence; and the general rule is that the party who loses the action has decree pronounced against him for the expense which he has occasioned to his opponent, as well as for the subject-matter of the suit. Regularly the question of expenses ought to be determined in the decree which settles the point of law; for the expenses are not demandable in a new action. As it is often the case that a party succeeds in one part of his action and fails in another, or occasions unnecessary expense by the unskilful and negligent way in which he conducts part of it, even though he may be right on the whole, the adjustment of the amounts incurred by both parties often involves not only much nicety of calculation, but also questions of considerable legal difficulty. When the adjustment of expenses is a matter of calculation it is effected by the auditors of the court. When it involves questions of law, these, if not previously decided by the judge, must be carried back to him from the auditor. Should either party object to the amount awarded by the auditor, he must lodge with the clerk of process a short note of his objections, without argument. A copy of this must be furnished to the agent of the opposite party, and the court may direct the objections to be answered orally or in writing. Should the objector fail to make good his objections he will have to bear the expense of discussing it.

EXPERIMENTAL PHILOSOPHY is that which deduces the laws of nature, the properties of bodies, and their actions upon each other, from experiments and observations. In our inquiries into nature we are to be guided by those rules and maxims which are found genuine, and consonant to a just method of physical reasoning; and these rules are, by Sir Isaac Newton, reckoned four, viz. 1. More causes of natural things are not to be admitted than are true, and sufficient to explain the phenomena; for nature is simple, and does nothing in vain. 2. Therefore, of natural effects of the same kind, the same causes are to be assigned, as far as it can be done; as of respiration in man and beasts, of the descent of stones in Europe and America, of light in a culinary fire and in the sun, and of the reflection of light in the earth and the other planets. 3. The qualities of natural bodies, which cannot be increased or diminished, and agree to all bodies on which experiments can be made, are to be reckoned as the qualities of all bodies whatever; thus, because extension, divisibility, hardness, impenetrability, mobility, inertia, and gravity, are found in all bodies under our inspection, we may conclude that they belong to all bodies whatever, and are the original and universal properties of them. 4. In experimental philosophy, propositions collected from the phenomena by induction are to be deemed (notwithstanding contrary hypotheses) either exactly, or very nearly true, till other phenomena occur by which they may be rendered more accurate, or liable to exception. This ought to be done, lest arguments of induction should be destroyed by hypotheses, and logical series be superseded by conjectures.

EXPLORATOR, a contrivance invented by Beccaria, consisting of a wire, whose insulated ends, provided with knobs of tin, are fastened to a pole over the chimney, or to the top of a tree. From this wire another leads into a chamber, through a glass tube covered with sealing-wax, communicating in the chamber with an electrometer, by which the electricity of the air may be daily observed.

EXPLOSION. A sudden bursting, generally due to the rapid production of gaseous matter from solids or liquids. Thus the explosion of gunpowder is due to the production of a comparatively enormous volume of gas during the re-arrangement of its solid materials, so as to form a mixture of gases.

EXPONENT, in mathematics, is the index of a root or power. For instance, if a quantity is multiplied by itself any number of times, instead of repeating the factor so many times we place over it on the right a figure denoting how often the number or magnitude has been multiplied by itself, for example,

$$a^4 = aaaa = a, a, a, a.$$
$$9^3 = 9 \times 9 \times 9 = 729.$$

EX POST FACTO, in law, something done after and bearing upon something previously done; thus a law is said to be *ex post facto*, when it is enacted to punish an offence committed before the passing of the law—a violation of the plainest principles of justice.

EXPRESSED OILS, in chemistry, are those which are obtained from bodies only by pressing, to distinguish them from animal and essential oils, which last are, for the most part, obtained by distillation.

EXTENSION, in philosophy, one of the common and essential properties of matter, or that by which it possesses or takes up some part of universal space.

EXTENSION, a logical term, put into contrast with another term, comprehension. A general notion is extensive according to the extent of its application. Thus European is more extensive than Briton, man than European, animal than man, and organized being than animal. Matter and mind are the most extensive classes we can form. This property of extension is gained by dropping more and more of the peculiarities of the included individuals. In short, very extensive notions have a very narrow signification; it is the less extensive that have the most meaning. The meaning of man, or the number of attributes implied in this generic expression, is large. Everything that constitutes a human being is expressed by this term, which is said to be more comprehensive than animal or organized being.

EXTENT, in law, the peculiar remedy for recovering debts of record due to the crown (that is, debts decided to be due by a court of record). It is a writ of execution directed to the sheriff against the body, lands, and goods of a debtor, all of which may be taken at once, and in this it differs from a writ of execution at the suit of a subject. These writs are of two kinds: *extent in chief* and *extent in aid;* to both of which the sovereign was entitled by ancient prerogative, in order to obtain satisfaction of debts due to him, or assigned to the crown. The writ of extent in chief is a proceeding by the king for the recovery of his own debt, and in which he is the real plaintiff. The writ of extent in aid is also sued out at the instance, and for the benefit of, the crown against a debtor of a crown debtor, but in this proceeding the crown is the nominal plaintiff only. Under this writ the real and personal property of the debtor may be taken in execution, and sold within seven days if the debt is not cleared off.

In Scotland *extent* is a term applied to several valuations of the lands of the kingdom which were made in early times for purposes of taxation. The first of these, or at least the first that is well authenticated, was carried out in the reign of Alexander III., and was long known as the old extent, in contradistinction to a later one made in accordance with a statute of 1474. Church lands were not included in these valuations, but were assessed separately. Cromwell introduced a new mode of assessment which fixed the rates to be levied on each county. Most of the public and parochial assessments were imposed according to these valuations up to the valuation acts of 1854 and 1857.

EXTRACT, a term used by chemists to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, &c. It has long been used in pharmacy to denote especially the soluble parts of vegetables, and according as water or alcohol was the solvent employed, the extracts were distinguished as *gummy* or *resinous.* Extracts vary in composition according to the plant treated, the solvent, the temperature, and other circumstances, and they generally contain several definite chemical compounds. Fourcroy, about the end of last century, after he had examined a number of extracts, thought that he had obtained a substance common to them all, to which he therefore gave the name of *extractive matter.* He supposed that it was at first soluble in water, but that by contact with the air it oxidized and became insoluble. Later experimenters showed the inaccuracy of these views, and the idea of such a principle has long since vanished from chemistry, but the name still remains, and is used in a vague way to denote in a vegetable analysis those portions of the vegetable extract which the analyst has not been able or willing to resolve into definite substances. In modern pharmacy the term extract is applied to two kinds of preparation from vegetables. One is got by digesting the plant or some portion of it in water or other solvent, and evaporating or distilling away the excess of solvent until the extracted matter is sufficiently inspissated. The other, which is only employed in a few cases, is got by bruising the plant in a mortar, separating the juice, warming it until the green colouring matter separates, and filtering it off. The juice is next heated until the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green colouring matter added and well mixed, and the evaporation is thereafter continued until the required concentration is attained. In preparing extracts attention has to be chiefly given to the regulation of the heat. A direct fire can only be used at the beginning of the operation; afterwards the evaporation must be conducted by a steam or water bath, by a current of warm air, or spontaneously. In any case care must be taken that the extract does not burn or char. Extracts are generally prepared from plants containing active principles, and are employed in pills and other drugs.

EXTRACT OF MEAT (*extractum carnis*), is a soft, yellowish-brown, solid or very thick syrup, which is employed as a portable soup. It is now manufactured on the large scale by processes proposed by Liebig. Finely-chopped flesh is exhausted with water, the extract is heated, when, at 133° Fahr., albumen coagulates; afterwards the blood colouring matter also separates, and when these are removed and the clear liquid is evaporated at a low temperature, the extract is ready. This substance has a characteristic odour of roast-meat, has a strong taste, dissolves in water, and forms a not unpalatable soup. It contains no fibrin, gelatine, albumen, or fat, but creatine, inosic acid, and other organic bodies are present, and it is especially rich in potassic salts and in phosphoric acid. It has the invaluable property of not spoiling by keeping; and it has been strongly recommended for its nutritious qualities; but its price limits the sale, and there is, besides, a dislike to food from other sources than perfectly fresh and new meat. It is very useful, however, for travellers, for troops, and for all persons who have to carry supplies of food about with them, or to prepare it rapidly. It has been objected to, however, on the score that with the exception of the potassium salts and phosphoric it is

devoid of the essentially nutritive portion of the meat, and contains chiefly decomposition products, the value of which, as food, has not been very distinctly made out.

EXTRACTOR, in midwifery, an instrument, or forceps, for extricating children by the head.

EXTRADITION, the act by which a person accused of a crime is given up by the government in whose territories he has taken refuge to the government of which he is a subject. In barbarous ages, when nations regarded each other as natural enemies, the crime committed in one was almost sure of impunity in another; and hence Beccaria ascribes the origin of extradition to the progress of civilization. Experience showed that nothing could be more efficacious to repress crime than the certainty that when it had been committed there was not a spot of earth where it could calculate on remaining unpunished, and international law founding on this fact adopted the principle of the extradition of criminals. In practice, however, many nice questions have arisen on this subject, and governments and jurists have found it very difficult to fix the limits within which the power of extradition ought to be exercised. Vattel wished it to be confined to crimes which attacked all nations by endangering the common safety. Grotius limited it to crimes of enormous magnitude. Conventions have been entered into by Britain with France and Denmark for the apprehension and extradition of persons charged with murder, attempt to murder, forgery or fraudulent bankruptcy; and with the United States for the extradition of persons charged with these offences, and also with piracy, arson, or uttering forged paper. The rule of refusing extradition of political offenders has been always maintained by Britain, and generally by civilized states powerful enough to adhere to it. But Austria, Russia, and some of the German powers have special treaties for this purpose.

EXTRADOS, the external outline or curve of an arch. See ARCHITECTURE.

EXTRAVASATION, in contusions and other accidents, is when blood-vessels are ruptured by the injury, and the blood finds its way into the neighbouring tissues. A good illustration may be found in an ordinary bruise, when the part becomes blue in consequence of the veins having been ruptured, and the venous blood having escaped into the tissues. Extravasation in the cranium is a most serious accident, as the pressure on the brain which is the result often produces death very rapidly. In some accidents to the urethra and bladder extravasation of urine is the result which in the majority of cases produces a fatal issue.

EXTREME UNCTION has been, since the twelfth century, one of the seven sacraments of the Catholic Church: the Council of Trent also declares it to be a sacrament (sess. xiv. canon 1 et seq.) It is performed in cases of mortal disease by anointing in the form of a cross, the eyes, ears, nose, mouth, hands and feet, the priest at each anointing repeating the prayer: Through this holy unction, and his most tender mercy may the Lord pardon thee whatever sins thou hast committed by thy sight (or hearing, taste, &c.) It can only be administered by a bishop or priest, and is not applied in the case of young children or excommunicated persons. The Catholic Church derives its opinion of the efficacy of extreme unction from the custom of the apostles to anoint the sick with oil, accompanied with prayer (James v. 14, 15). . The Protestants deny the sacramental signification and power of this ceremony, because nothing is known of a formal establishment of it by Christ. In the Greek Church it is administered not only to sick persons, but generally in diseases of all kinds, as tending to promote the restoration of health and the forgiveness of sins.

EXTREMITIES. This term is applied to the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior. Each extremity is divided into three parts: the upper into the shoulder, the arm, the fore-arm, and the hand; the lower into the thigh, the leg, and the foot. The upper is articulated to the shoulder-blade or scapula, the lower to the pelvis. In fishes the extremities are modified into the pectoral and ventral fins.

EXUVIÆ, among naturalists, denotes the cast-off parts or coverings of animals, as the skins of serpents, caterpillars, and other insects.

EY, a Scandinavian word, signifying island, and contained in several geographical words, as *Anglesey*, the island of the Angles.

EYCK, HUBERT VAN, a Flemish painter, considered as the founder of the Flemish school, was born in 1366 at Maeseyk. He was much distinguished by his paintings in distemper; and after the introduction of oil painting, he practised in that with equal success. By some authorities he is credited with the general conception of the great picture of the Adoration of the Lamb (see following article), which is the first painting on an extensive scale in oil. He died in 1426.

EYCK, JAN VAN (also called *Jan van Brugge*, or *John of Bruges*, from Bruges, the place of his residence), was born towards the close of the fourteenth century. His elder brother, Hubert, gave him his first instruction in the principles of the art, and his talents were so rapidly and vigorously developed that he soon surpassed his brother, and became the admiration of his own and succeeding times. The two brothers resided at Bruges, then much frequented by the noble and the wealthy on account of its flourishing commerce. About 1420, or soon after, they went to Ghent for a considerable time, to execute together a very large work which Josse Vydt, a Flemish noble, had engaged them to do. This is the celebrated Adoration of the Lamb for the cathedral of Ghent; a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It is painted on wood, with side panels, which contain the portraits of the two artists and of their sister Margaret, likewise a painter. Of these panels six are now in the royal museum of Berlin. At the brilliant court of Philip the Good of Burgundy, by whom Jan was made painter to the court, the brothers had the best opportunities of improving their taste by spectacles of splendour of all kinds, dresses, jewels, furniture, arms, banquets, &c. Jan particularly availed himself of them in his works, in which such objects are represented with remarkable truth. Hubert did not live to see the painting above mentioned completed. He died at Ghent, as did also his sister Margaret. Jan finished the work in 1432, and returned to Bruges, where he remained till his death, which took place in 1441, and executed several excellent pieces.

The reputation of this celebrated painter became very great even during his lifetime, by his great share in the introduction of oil-painting; the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck was also of great service to the art by his improvements in linear and aerial perspective, and in painting upon glass. In regard to the first, we will only remark that it was a general custom, before his time, to have for the background of the picture a flat gold ground, from which the figures stood out without perspective, as may still be seen in numberless works of earlier date.

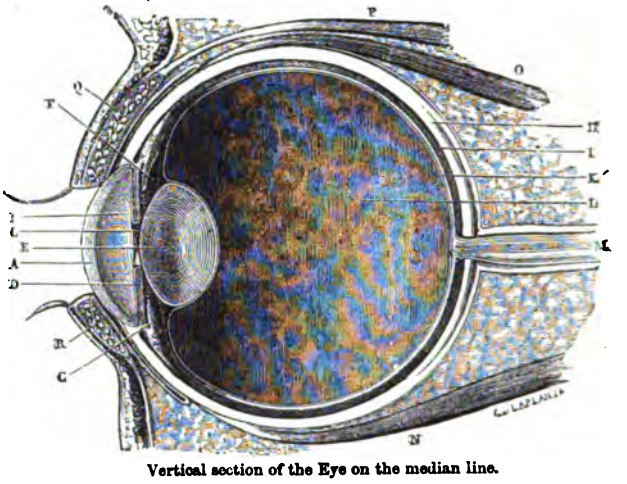
Van Eyck himself followed this practice in his earlier efforts, but, as he made further advances in his art, conceived the idea towards which there had been hitherto only some distant advances of giving a more natural grouping and perspective to his figures by a natural back-ground. In this he succeeded so eminently, as many of his still remaining works prove, that he may be called in this respect the father of modern painting, since he gave the art a new turn and impulse, and laid the foundation of that high degree of improvement which it afterwards attained in the brightest era of the great masters who succeeded him in the Netherlands and in Italy. In the art of painting on glass he is considered as the author of the mode of painting with colours delicately blended, and yet so firmly fixed that obliteration was impossible—an object before attained only by joining together (in mosaic) several small panes of different colours. The influence of Jan van Eyck, both as an artist and as an inventor, or rather improver of several branches of the art, was therefore very great. The school of which he was, in some measure, the founder, does not yield in celebrity to the best contemporary or succeeding artists, although it must be allowed to be often defective in the representation of the extremities of the human body—a fault occasioned by that excessive delicacy which prevented the study of naked forms, and of anatomy in general. On the other hand, the face, dresses, grouping, distribution of light and shade, are always superior, and the colour brilliant and splendid, in the works of this painter and most of his scholars. Many of his paintings are still preserved, either in churches and museums, or in private collections. Among his scholars are reckoned, besides the nearly contemporary Antonello of Messina, Roger van Brugge, Hans Hemling, and others, also the later masters, Albert Dürer, Luke of Leyden, Hans Holbein, Lucas Kranach, &c.

EYE. The visual apparatus consists of the globe of the eye, of the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus.

The Globe of the Eye.—The globe of the eye may be described as a spheroid, to which the segment of a smaller sphere is applied in front. The walls of the globe of the eye are formed principally of two fibrous membranes; one white and opaque—the *sclerotic* from the Gr. *sklēros*, hard—which envelops two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name, *cornea* (Lat. *corneus*, horny). The sclerotic is one of the strongest fibrous membranes in the body; it is white on its external surface, and of a light brown colour internally; it is thicker at the posterior portion of the eye, where it opens to allow the passage of the optic nerve, than in front, where it terminates in a slightly thickened rim, into which the cornea is set like a watch-glass. The two membranes adhere together so strongly as to seem but one. The cornea is thicker than the sclerotic, and is composed of superposed layers perfectly transparent; it is convex in front, and concave behind, and appears to be circular, although its transverse diameter may be a little greater than the other. A mucous membrane, the *conjunctiva*, so named because it unites the eye to the lid, spreads over the anterior portion of the globe, and then folds back on itself and lines the internal surface of the eyelids.

Choroid, &c.—On the internal surface of the sclerotic is a vascular membrane called the *choroid*, which lines it from the bottom of the eye nearly to the circumference of the cornea, and is attached to it by a very fine cellular tissue. The choroid is composed of two layers, of which the external corresponds to the sclerotic, and the internal or *membrane of Ruysch* corresponds to the retina. The outer of these two layers contains the vascular trunks, the inner the capillaries connecting them. The vessels ramify in connective tissue, which contains pigment cells in its sclerotic portion, but passes inwards into a colourless network. The inner surface of the inner layer is covered with flat pigment cells. The choroid is pierced behind by an opening, which gives passage to the optic nerve; in front, near the circumference of the cornea, the capillary meshes are coarser and project inwards as the ciliary processes. The *ciliary circle*, *ring*, or *muscle*, is a little band, vascular like the choroid, slightly adherent by its external surface to the sclerotic, and united by its lesser circumference to the cornea, at the point where the latter attaches itself to the sclerotic; in it there are two sets of unstriped muscular fibres, an outer radiating and an inner circular set. Behind the ciliary circle are the *ciliary processes*, the whole of which, joined together and forming a crown, constitute the *ciliary body* or *disk*. These rays, which are attached to the choroid, like the ciliary circle, are of two kinds: one which is received into corresponding grooves in the capsule of the crystalline lens; the others extend to the iris, behind which they form a sort of circular curtain, by folding back on themselves, and adhering to the larger circumference of this membrane. Thus fixed by one border, the ciliary disk floats like a fringe behind the iris, yielding to the slightest impulse which may be communicated to it. The ciliary processes are covered with a thick layer of pigment.

Iris and Pupil.—In front of the ciliary circle and the ciliary processes the larger circumference of the *iris* is fixed. This membrane forms a vertical partition behind the cornea, and is pierced in the middle by a circular opening called the *pupil*. It represents



Vertical section of the Eye on the median line.

A, Cornea. B, Anterior chamber. C, Pupil. D, Iris. E, Crystalline lens. F, Zone of Zinn, forming the anterior wall of canal of Petit. G, Ciliary processes and circle. H, Sclerotic. I, Choroid. K, Retina. L, Vitreous body. M, Optic nerve. N, Right inferior muscle. O, Right superior muscle. P, Levator muscle of eyelid. Q, Lachrymal glands. R, Lachrymal canal.

exactly what is called a diaphragm in optical instruments. It consists of vessels, circular and radiating, of fibrous tissue, and non-striated muscular fibres, which form a ring round the orifice of the pupil, and send thence radial bundles. Its anterior surface contains more or less pigment, and is thus coloured in different shades according to the individual, the variety of which has given to the membrane the name of iris, or the rainbow. Its posterior face is covered with a layer of pigment, which is called the *uvea*. It is well known that the pupil dilates in the dark, and contracts on the contrary in a bright light, only allowing that quantity of luminous rays to enter the eye which is necessary to vision. Certain substances when taken into the system act similarly on the iris; such are opium and the Calabar bean, which cause the pupil to contract; belladonna, on the contrary, dilates it. Changes in the diameter of the pupillary opening also result from certain affections of the eye and brain, and of the sympathetic nerves.

It has been remarked that the posterior surface of the iris, the ciliary processes, and the choroid are covered with a layer of *pigment*. In the eye this pigment plays the same part as the lamp-black in the interior of certain optical instruments, as the telescope and magic-lantern; it absorbs the luminous rays, and prevents them from being reflected, which would confuse the vision.

Retina.—The internal surface of the choroid, or rather the pigmentary layer which covers it, is lined by the *retina* or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve, which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, and forms at the bottom of the globe an enlargement, which is called the *papilla of the optic nerve*. The retina develops itself from the papilla, around which it forms a fold, and extends over the cavity of the eye to the circumference of the ciliary processes of the vitreous body, where it ends with a finely festooned margin, a cellular membrane running on to the ciliary processes, where it is lost. It is of an opaline pinkish colour, semi-transparent, and easily torn. Its centre, which corresponds to the antero-posterior axis of the eye, is to the outside of the papilla of the optic nerve, where there is the yellow spot (*macula lutea*) of Sömmering, and its central depression (*fovea centralis*). The yellow spot seems to be the point in the eye where vision is most distinct. Neither cones nor nerve-cells are present in it. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular, and in contact with the choroid; the external one, very important in a physiological point of view, is the *membrane of Jacob*. It is composed of cones and cylinders or *rods*, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosaic, each microscopic division of which is about 0·001 of a line in diameter according to Robin, and 0·0008 of a line according to Helmholtz; and represents a section of a rod. We shall see what part these terminal points play in vision.

Vitreous Body.—The whole posterior portion of the cavity of the globe of the eye is occupied by a translucent substance called the *vitreous humor*. According to most anatomists, it is contained in an envelope called the *hyaloid membrane*. The vitreous humor and the hyaloid together constitute what is called the *vitreous body*, which coincides with the retina throughout its whole extent, and in front takes the form of the posterior surface of the crystalline lens. According to those anatomists who admit the existence of the hyaloid, it becomes continuous with the ciliary zone of Zinn, or the *ciliary processes of the vitreous body*, while a thin layer passes inwards to the posterior face of the lens. Between these diverging layers is the *canal of Petit*, which runs round the margin of the lens.

Crystalline Lens.—This is the name given to a double convex lens, more curved posteriorly than anteriorly, translucent, and placed vertically in the axis of the eye, so that the axis of the lens corresponds to the centre of the pupil. The lens is formed of superposed layers, which are less consistent outside than towards the centre; it is contained in a *capsule*, which applies itself closely without adhering to it. The greater or less convexity of the surfaces of the lens modifies the power of the eye, determining whether the vision is long or short, that is, presbyopic or myopic. The opacity of the lens, or of its capsule, forms the disease called *cataract*. We have already stated that its edge is set into the zone of Zinn, to which its capsule adheres.

Anterior and Posterior Chambers of the Eye.—Formerly a certain space was supposed to exist between the crystalline lens and the iris; this was called the *posterior chamber* of the eye. We now know that the posterior surface of the iris is in direct contact, though not continuous, with the anterior surface of the lens, and the posterior chamber is only an imaginary space. The interval which divides the iris from the cornea is the *anterior chamber*, which is filled with a fluid called the *aqueous humor*, translucent like the vitreous but less dense; it is secreted by the ciliary processes.

Muscles of the Eye.—The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the centre of the globe is immovable, and the eye moves around its transverse and vertical diameters. These three orders of movements are independent of each other, and may be made singly, or in combination, in such a manner as to direct the pupil towards all points of the circumference of the orbit. The straight, superior, inferior, external, and internal muscles move it upward, downward, inward, and outward, and their successive action gives it a movement of circumduction. The two oblique muscles turn the eye on its antero-posterior axis, in such a manner as always to maintain the horizontal position of its transverse diameter, when the head or the body inclines to the right or the left. All these muscles take a direct or indirect part in every movement of the eye; if looking up or down, for example, the straight, superior, or inferior acts alone; the other muscles assure the movement, and confine it to the transverse axis. Such is the perfection of this mechanism, that the cornea is raised or lowered without the least lateral deviation, and the eye perceives by this succession of movements if the image of a line on the retina deviates 0·00002 of an inch from the vertical. The eyelids follow the movements of the globe when it is raised or lowered, obeying the action of the muscles of which they receive the aponeurotic prolongations. The movements of the two eyes are always symmetrical, and of the same kind; both are raised or lowered at once, directed to right or left, or around their axes; they can be turned inwards simultaneously to see an object very near at hand, or slightly outwards, when they turn from such a point to one in the distance. Even when one eye is closed, the globe turns in the same direction as that of the open eye.

Eyelids.—An elliptical muscle extends in front of the orbit, which is formed of concentric fascicles, and which presents a transverse chink closed during contraction, and open in the shape of an almond when

its fibres are relaxed. This is the *orbicular muscle of the eyelids*. Its internal surface, that is the one next the eye, is covered by the conjunctiva, its external by the skin, its opening is circumscribed by the edge of the lids, which are made firm by the *tarsal cartilages*. The upper lid is larger than the lower, and is raised by a special muscle, the contraction of which alternates with that of the orbicularis muscle, which is its antagonist. The points where the eyelids are united by their commissures are called the *angles of the eye*. At the internal or greater angle of the eye the conjunctiva forms a fold, the *semi-lunar fold*, which is in fact a rudimentary representative of the third eyelid or nictitating membrane (*membrana nictitans*) of certain animals. Inside of this fold is the *lachrymal caruncle*, a small glandular body of a rose colour, which is covered by the conjunctiva. The edges of the lids are ornamented with a fringe of silky hairs which protect the eye, and add greatly to its beauty. The greater or less extent of the opening of the lids makes the eye appear larger or smaller; the conformation of the palpebral muscles and the tarsal cartilages gives to the eye an elongated and languishing form as in the East, or round and bold as among the western peoples, but the dimensions and form of the globe are the same in all countries and in all individuals.

The upper lid, which is attached to the arch of the orbit, is surmounted by the *eyebrow*, which is designed to protect the eye like a visor, and its movements play an important part in the expression of the face.

Lachrymal Apparatus.—This is composed of, firstly, the *lachrymal gland*, which lies in a depression of the orbital arch, and of little glands of the same nature, which form a granular layer in the substance of the upper lid; secondly, of the *lachrymal canals*, by which the tears are poured out upon the conjunctiva, a little above the border of the upper lid; thirdly, the *lachrymal ducts*, which are destined to receive the tears after they have bathed the eye, and of which the orifices or *lachrymal points* are seen near the internal commissure of the lids; fourthly, the *lachrymal sac*, in which the lachrymal ducts terminate, and which empties the tears into the *nasal canal*. The tears by running over the surface of the conjunctiva render it supple and facilitate the movements of the globe and eyelids by lessening the friction. The influence of moral or physical causes increases their secretion, and when the lachrymal ducts do not suffice to carry them off they run over the lids.

Vision.—Among the phenomena, which, taken together, constitute *sight*, some belong to the domain of physics (see the article Optics), and may be submitted to investigation, many may even be demonstrated by experiment; while others, on the contrary, are patent to the observation, but little known as to their cause or their mechanism, and await from the progress of science an explanation which physiology has as yet been unable to give. Even in those phenomena which at first seem purely physical, we must not forget that the refracting media of the eye are organized, and cannot be compared except by approximation to inorganic bodies, on the form and density of which physicists base their calculations. This is necessarily the cause of the differences in the theories promulgated in regard to vision; for although the eye may in some respects be considered as an optical instrument, we can never arrive at exact deductions by comparing organs analogous or even similar in their construction, but different in their nature.

The retina renders the eye sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to convey the luminous rays to its surface under conditions necessary to a nervous impression, which all combine to insure, but which is accomplished in the retina alone. Other causes besides the contact of luminous waves may excite the retina; thus the pressure of the finger on the eye, for example, and the disturbance resulting from a fall or a blow on the head, the action of electricity, and certain affections of the eye and brain, give rise, in the absence of natural or artificial light, to luminous images varying in form and intensity. Light produced under these conditions is called 'retinal light;' the image produced by pressure is known as a 'phosphene.'

Like the optic and the other special nerves of the organs of sense, the retina has a special sensibility; it receives the impression from the light and transmits it by means of the optic nerve to the brain, but it is not itself sensitive to touch. No mechanical irritation causes it the slightest pain. In a normal condition the action of a too brilliant light, and in certain affections of the eye and brain the least ray will cause a painful sensation, but this pain must be referred either to the brain or to the nerves of the iris or of the ciliary circle, independent of the retina and the optic nerve. It is a remarkable fact that a limited portion of the retina, corresponding to the papilla of the optic nerve, is totally insensible to light; or has, at any rate, a very obtuse sensibility. This 'blind point' is the only one on the internal surface of the eye which is not covered with pigment.

If we trace two figures on a horizontal line on a piece of paper placed vertically, and then shut the right eye, and fix the left on the right figure, at certain distances we can see both of them more or less distinctly; but varying the distance of the paper from the eye, there is a point when we only see the figure upon which the eye is fixed; the other disappearing entirely, though it reappears when we change the position of the paper, or cease to look fixedly at one figure. The greater the distance between the two figures, the greater must be the distance of the paper from the eye, in order to render one of them invisible. The image of the invisible one is then projected on the blind point, and it reappears, when by the displacement of the paper the angle which its rays form with those from the other becomes greater or less.

In order that vision may be distinct, it is necessary that the rays should enter the eye in the direction of what is termed the visual axis, and the various movements of the organ tend unceasingly to place it in a position to fulfil this condition, and it is necessary, also, that the light should be neither too strong nor too weak, and that the rays shall traverse the central portion only of the crystalline lens, and not its borders. In order to obtain an analogous result in some of their instruments, opticians divide them by means of a partition pierced by a hole in the centre, which is termed a diaphragm. We find a similar arrangement in the eye, 'an intelligent diaphragm,' to use the expression of M. Longet, that is, the iris, which dilates or contracts the pupil in such a manner as to measure the quantity of light necessary to vision, and which only allows those rays to pass which are directed toward the central portion of the crystalline lens. In the dark, or if we look at an object but slightly illuminated, the pupil dilates in order to admit the greatest possible number of rays which are refracted by the cornea; it is the same if we look at a distant object, the rays from which are less divergent; if this object becomes more luminous, or if we approach it, the pupil contracts in proportion.

The visual impressions are transmitted from the retina to the brain by means of the optic nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the

orbit toward the centre of the base of the skull, where there is an interlacement of their fibres in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the *chiasma* or *commissure* of the optic nerves. Physiological theories, which are no longer tenable, have been deduced from this crossing of the nerves, but nothing positive is yet known of the relation between this disposition and the visual function. Mechanical irritation of the nerve seems to develop luminous impressions as in the retina, but it causes no pain whatever.

Interior Vision.—The eye perceives not only external objects, but certain details of its internal organization. This portion of the visual phenomena is called *interior vision*, or *entoptics*. A bruise of the cornea through the lids, or a scar of foreign body on its surface, the vascular ramifications of the retina, and other causes of that nature, sometimes throw images on the retina of different forms, such as striæ, spots, globules, dark or luminous circles which appear to move in the eye. Certain of these images are called flies, or motes (*muscæ volitantes*), because they traverse the field of vision from one side to the other. Their appearance results from nothing abnormal, and they cannot be confounded, when there is no other disturbance of the visual functions, with the analogous signs which accompany and denote some diseases of the eye and brain. A lateral movement of the eye is sufficient to displace them or cause them to disappear.

Binocular Vision.—The difficulty which some persons have felt in reconciling the fact of an inverted image on the retina with the perception of an object in its true position is altogether fanciful, and arises from confused notions as to the nature of perception. The question as to how it is that we see objects single with two eyes rests upon a different footing, and is not to be altogether explained by habit and association. To each point in the retina of one eye there is a *corresponding point*, similarly situated in the other. An impression produced on one of these points is, in ordinary circumstances, undistinguishable from a similar impression produced on the other, and when both at once are similarly impressed the effect is simply more intense than if one were impressed alone; or to describe the same phenomena subjectively, we have only one field of view for our two eyes, and in any part of this field of view we see either one image brighter than we should see it by one eye alone or else we see two overlapping images. This latter phenomenon can be readily illustrated by holding up a finger between one's eyes and a wall and looking at the wall. We shall see as it were two transparent fingers projected on the wall. One of these transparent fingers is in fact seen by the right eye, and the other by the left, but our visual sensations do not directly inform us which of them is seen by the right eye and which by the left.

The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinæ; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. We are thus furnished with a direct indication of the distance of the object from our eyes; and this indication is much more precise than that derived from the adjustment of their focal length, of which we are now to speak.

Accommodation of the Eye to Distance.—The power possessed by the eye of seeing with equal distinctness the images of objects at very unequal distances has long been the subject of investigation, and the question is not yet settled. The most generally received explanation is, that in order to see objects at different distances, and especially very near to the eye, it modifies its form, or that of its media, and adapts itself to the distance in such a manner that the retina is always in the focus. According to some authors the length of the axis of the eye varies, the retina approaching or receding from the crystalline lens. Others maintain that it is the lens which changes its place, or that the curves of the refracting media modify themselves in such a manner as always to make the apices of the luminous cones coincide with the immovable retinal surface. Helmholtz believes that the anterior surface of the crystalline lens increases in convexity in looking at objects near at hand, and flattens when looking at a distance, and that the pupil contributes also to the accommodation by contracting in looking at objects near at hand, and dilating to see at a great distance. Nothing positive, however, is known regarding the manner in which this change of form in the crystalline is effected.

Defective Vision.—The eye in its different parts is subject to various diseases and affections, some of them common to other parts of the body, others peculiar to itself. When the transparency of the cornea, the crystalline lens, or any of the humours, is destroyed, either partially or entirely, then will partial or total blindness follow, since no image can be formed upon the retina: but although all the humours and the cornea be perfectly transparent, and retain their proper forms, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerve, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. To the first class belong those diseases called cataract, ophthalmia, &c., and to the second amaurosis, or gutta serena, &c. Although a person may not be under the influence of any of these diseases, yet defective vision may arise from the crystalline lens being so convex as to form an image before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the lens may be too flat, as is the case in old age, a defect which is corrected by convex lenses. See OPTICS.

The Eye in Comparative Physiology.—The eyes of different species of animals differ considerably in form and number. In animals that inhabit the lower regions of the atmosphere, including those that move along the surface of the earth, the eye is nearly spherical, the longest axis being from the cornea to the retina. In fishes the fore part of the eyeball is much flattened; in some the eyeball is like a hemisphere, the anterior part of which is flat, and in others the superior part is likewise flat; but in birds which occupy the higher regions of the atmosphere the deviation from the spherical form is in the contrary direction to that of fishes. The aqueous humour is more abundant in high-flying birds than in animals near the surface of the earth, and still more than in fish, in which last it is sometimes wanting. The crystalline lens is most globular in fishes, and flattest in birds. The less spherical the form of the eye is the stronger is the sclerotic. In the cuttle-fish the cornea is wanting, the iris is of a deep tawny brown colour; in the mammalia and in birds it varies from a bright yellow, red, or clear blue, according to the species. In fishes it is of a golden or silvery lustre, and in reptiles it is intermediate in metallic lustre. The pupil is round in man. In the cat kind it is formed by two elliptical segments, the opening running parallel to the direction of the nose. In ruminating

animals, the horse, and the whale, the opening runs transversely, and in the dolphin it is of a heart form. The adaptation of peculiar structure in the eyes of animals to their wants and situations forms a striking and interesting branch of physiology. The eyes of articulated animals, as the lobster, consist of structures which may be compared to the rods and cones of the human eye; but there is neither lens nor humors, and the mode in which the image is formed is not determined by physiologists.

EYE, in agriculture and gardening, signifies a little bud or shoot, inserted into a tree by way of graft.

EYE, a municipal and parliamentary borough, England, county Suffolk, in a fertile valley, 19 miles north of Ipswich. It consists of narrow and irregular streets, has a parish church with a handsome square tower, Baptist and Methodist chapels, a town-house, jail, and house of industry; claims to be a borough by prescription, and sends a member to Parliament. Pop. mun. bor., 2396; parl. bor., 6721.

EYEBRIGHT (*Euphrasia officinalis*), a small plant belonging to the natural order Scrophulariaceæ, which is common in Britain and most parts of Europe, in North Asia, &c. It is annual, from 3 to 8 inches high, often much branched; the leaves ovate and dentate; the flowers axillary and almost sessile, white, streaked with purple, and with a yellow spot on the lip. It is a pretty little plant, and occurs so abundantly in some places as to give the ground a whitish hue when in flower. The whole plant has a bitter taste. Under the name of euphrasy it formerly enjoyed a great reputation in diseases of the eyes.

EYELET HOLES, round holes worked in a sail, to admit a small rope through, chiefly the robins (or rope-bands), and the points or reef-line.

EYELID. See EYE.

EYE OF A DOME, an aperture at the top of a dome, as that of the Pantheon at Rome, or of St. Paul's at London: it is usually covered with a lantern.

EYLAU, PREUSSISCH, a small town, about 28 miles distant from Königsberg, in Prussia Proper, with 3518 inhabitants, on the lake of Arschen, famous for a bloody battle fought between Napoleon and the allied Russians and Prussians, on the 7th and 8th of February, 1807. The chief battle was on the 8th, and lasted twelve hours, amid the thunder of 300 cannon. The carnage was increased by a fall of snow, under the blinding influence of which the column of Augereau marched too far to the left, and thus failing in their object, caused the battle to be much longer protracted. Augereau himself was wounded, and his corps dissolved and incorporated with the others, so much had it suffered. Ney and Davout, who were despatched by the Emperor Napoleon to outflank the enemy, at last succeeded, and decided the battle; but the loss on both sides was terrible. Various statements of it have been given by the two parties, but the probability is that it amounted to about 18,000 on either side. Nine Russian generals were wounded; three French generals killed, and five wounded.

EZEKIEL (God shall strengthen), the third of the great prophets, a priest, and the son of Buzi. He was carried away when young (about 599 B.C.) into the Babylonish captivity. Here he received the gift of prophecy, while he was among other captives by the river Chebar. He was commanded by God in a vision to speak to the children of Israel, and to watch over his people. In another vision God revealed to him the sufferings which the Israelites were to undergo for their idolatry. God also revealed to him the end of the captivity, the return of his people, the restoration of the temple and city, and finally, the union of Judah and Israel under one government, and the return of their former prosperity. He was also miraculously informed of the siege of Jerusalem by the Chaldeans, and communicated the information to his fellow exiles. He prophesied against Egypt, against Tyre and Sidon, against the Idumeans and Ammonites. His prophecies are divided into forty chapters; they are obscure, but full of poetic fire. Their genuineness and just title to a place in the sacred canon cannot be disputed.

EZRA, a celebrated Jewish scribe and priest, lineally descended from Aaron, and according to Josephus, high-priest of the Jews who were left in Babylon. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I., about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging, and in some measure, it is believed, settling the canon of Scripture, are specially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he died in Jerusalem, and was buried there with great pomp; others assert that he returned to Babylon, and died there at the age of 120 years. Ezra is said to have introduced the present square Hebrew characters, and to be the author, not only of the book which bears his name, but also of the Chronicles, Nehemiah, and Esther. The book of Ezra contains an account of the favours bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him. It is written partly in Hebrew and partly in Chaldee, which have led some to conclude that it is the work of different hands.

F.

F is the sixth letter of the English and other alphabets of Western Europe, as it was also in the Latin alphabet, from which they are derived. The Latin alphabet was obtained from the Greeks of Southern Italy and Sicily, and the Latin F is the so-called Æolic digamma, which, as a written character at least, is not found in the existing remains of Greek literature. In classical Greek the letter Φ had the power of F, and accordingly it was used in transliterating Latin words into Greek, thus the Latin Fabius became in Greek Φάβιος. Conversely in Italian, Spanish, and Portuguese, *f* is always used in words derived from the Greek, where we use *ph*. The letter can be traced back to the Phœnician alphabet, which, as is well known, was the first introduced into Europe. F represents the sound produced by bringing the upper teeth against the lower lip, and then breathing with a slight hissing sound. It therefore belongs to the letters known as aspirates, and is called a labial aspirate. In Sanskrit there is no sound corresponding

to that represented by F, but in the other Indo-European or Aryan languages it occurs. In English roots in F that are also common to Sanskrit, Latin, and Greek, we find that the *f* represents *p* in these latter languages; thus *foot* corresponds to Sanskrit *pada*, Greek *pous*, *podos*, Latin *pes*, *pedis*; so *father* corresponds to Sanskrit *pitri*, Greek *patĕr*, Latin *pater*; *off*, Sanskrit *apa*, Greek *apo*; *for*, Sanskrit *para*, Greek *para*, Latin *per*; *flood*, Sanskrit *plu*, Greek *pleo*, Latin *pluo*, &c. The Latin *f* passes frequently into *h* in the Romance languages, thus *ferrum*, *filius*, *facere*, *formosus*, became in Spanish *hierro*, *hijo*, *hacer*, *hermoso* (all with *h* mute); *foris*, French *hors*; *fabulari*, *fanum*, *fœdus*, Walachian *hebleïre* (Spanish *hablar*), *han*, *hed*, &c. The Romans for some time used F inverted, thus, Ⅎ, for V consonant, as TERMINAⅎIT for TERMINAVIT, or DIⅎI for DIVI. Some have supposed that this was one of the three letters invented by Claudius, but many inscriptions, belonging to periods much anterior to the time of Claudius, exhibit this singular use of this letter. *F* signified, as a number, among the Romans, 40; with a dash over it, 40,000. *F*, on engravings or pictures, stands for *fecit* or *faciebat* (made). In jurisprudence, *ff* signifies the *pandects*. This abbreviation originated in the early period of the art of printing, when no Greek characters had yet been cast, and *ff* was used for π, the first letter of πανδέκται. On medals, monuments, &c., *F* stands for *Fabius*, *Furius*, &c., *Filius*, *Felix*, *Faustus*, &c. *FF*, on Roman coins, means *flando*, *feriundo*. On French coins, *F* means the *mint of Angers*; on Prussian coins, *of Magdeburg*; on Austrian, *of Halle in the Tyrol*. *F*, with merchants, signifies *folio* (page). *F* often stands on documents for *fiat* (let it be done, granted, &c.) *Fl.* is the abbreviation for *florin*, or guilder; *fr.* for *franc*; *ff*, in German, for *folgende*, like *seq.* in English.

F, the fourth note in the natural diatonic scale of C, standing in proportion to the tonic as 4 to 3. F major, as a key, has one flat at its signature. F minor, the relative minor of A flat major, has four flats. The F or Fa clef is another name for the bass clef. *F*, in music, over a line, means *forte*; *ff*, *molto forte*.

FA, the name given by Guido to the fourth note of the natural diatonic scale of C.

FABBRONI, Giovanni, an eminent Italian philosopher, who distinguished himself by his attention to political economy, agriculture, and physical science. He was born at Florence in 1752, and died in 1822. He was a leading member in numerous learned and scientific societies, and left behind him a considerable number of valuable memoirs and treatises on matters relating to chemistry, agriculture, physiology, &c., of which the best known are Provvedimenti Annonarj; his Discourses on National Prosperity, on the Equilibrium of Commerce, and the Establishment of Custom-houses; on the Effects of the Free Traffic in Raw Material; on Rewards for the Encouragement of Trade; on the Chemical Action of Metals; on the Value and Reciprocal Proportion of Coins; on the Scales and Steelyards of the Chinese; on the Palaces of Spain; and on the Ancient Hebrew People.

FABER, Rev. George Stanley, an able and popular theological writer, born in 1773, was the eldest son of the Rev. Thomas Faber, rector of Calverley in Yorkshire. Before his sixteenth year he entered University College, Oxford, and before his twenty-first was a fellow and tutor of Lincoln College. Having been Bampton lecturer in 1801, he shortly after published his lectures under the title of Horæ Mosaicæ, of which a second edition augmented was published in 1818. From the first he had adopted what is called evangelical views, and he soon began to give them efficient aid by his pen, particularly by a work on baptismal regeneration, entitled The Doctrine of Regeneration in the Case of Infant Baptism. In 1803, when his marriage made it necessary to resign his fellowship, he became curate to his father. He was afterwards vicar successively of Stockton-upon-Tees, Redmanshall, and Longnewton, the last of which appointments he had held for twenty-one years, when he resigned it to become master of Sherburn Hospital. The year before he had obtained a prebend in Salisbury Cathedral. His principal writings, in addition to those already mentioned, are A Dissertation on the Prophecies, the most popular of all his works, having in 1818, only four years from its first appearance, reached a fifth edition; and the Difficulties of Romanism, of which a third edition appeared in 1853. Mr. Faber died on 27th January, 1854.

FABII, an ancient and renowned family of Rome. One of the legends in ancient Roman history is, that all of them who were able to bear arms, 306 in number, with 4000 clients, established themselves in a post on the river Cremera, not far from Rome, to protect the Roman territory against the incursions of the Veientines. Being drawn into an ambush, they were killed to a man (B.C. 477), the sole representative of the family being a boy who happened to be left in Rome, and who thus became the second founder of the Fabian gens. Among the most celebrated members of the gens in after-times was Fabius Maximus Cunctator, the well-known opponent of Hannibal in the second Punic war. See Hannibal.

FABLE, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, which are meant to inculcate a moral lesson in a pleasant garb. The *fable*, as a particular kind of poetry, sometimes called *apologue*, is justly considered a species of didactic composition, and is a kind of *allegory*. It may be described as a method of inculcating practical rules of prudence or wisdom by imaginary representations drawn from the physical or external world. It consists properly of two parts—the symbolical representation, and the application, or the instruction intended to be deduced from it, which latter is called the *moral* of the tale, and must be apparent in the fable itself in order to render it poetical. On account of its aim it lies upon the borders of poetry and prose, is rarely in true poetic spirit, and pleases independently of its object. The satisfaction which we derive from fables does not lie wholly in the pleasure that we receive from the symbolical representation, but lies deeper—in the feeling that the order of nature is the same in the spiritual and the material worlds.

Herder divides fables into—1. *Theoretic*, intended to form the understanding; thus a phenomenon of nature, as illustrative of the laws of the universe, is used to exercise the understanding. 2. *Moral*, which contain rules for the regulation of the will. We do not learn morality from the brutes, but view the great family of nature, and observe that she has connected the happiness of all living creatures with the unchangeable, eternal law of effort, and take example from the observance of this law by the lower orders of creation. 3. Fables of *fate* or *destiny*. It cannot always be made evident how one thing follows as a necessary consequence from another; here then comes in play that connection of events which we call *fate*, or *chance*, and which shows that things follow, at least after, if not from one another, by an order from above. Thus the eagle carries with her plunder a coal from the altar, which sets fire to her nest, and thus her unfledged brood becomes the

prey of animals which she has already robbed of their young. The plan of the fables is regulated by this threefold division of the subject and character. In general it must possess unity, that the whole tenor of it may be easily seen; and dignity, since the subject has a certain degree of importance. But this does not exclude gaiety nor satire.

The oldest fables are supposed to be the oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. (See PILPAY and LOKMAN.) Æsop is well known among the Greeks, and was imitated by Phædrus among the Latin writers. Bodmer has published German fables of the time of the Minnesingers. The first known German fabulist is Stricker, who belongs to the first half of the thirteenth century, but the famous medieval fable of Reincke Fuchs has a much more remote origin. Boner, who lived at the close of the fourteenth century, shows in his Edelstein the true spirit of fable. Burkard Waldis may be mentioned in the sixteenth century. The most successful of German fable-writers is undoubtedly Lessing. In the seventeenth Gay among the English, and La Fontaine among the French, were distinguished. The writer last named made fable the vehicle of wit, and carried it to its highest stage of perfection. Among the most interesting modern productions in this department of literature the Fables of the Russian, Ivan Kriloff, deserve special mention.

FABLIAUX (from the Latin *fabulari*, or *fabellari*, to speak or narrate), in French literature, the short metrical tales of the Trouvères, or early poets of the Langue d'Oil, or dialect of the northern provinces, composed for the most part in the twelfth and thirteenth centuries. These productions were intended merely for recitation, not for singing, and had as their principal subjects the current gossip and news of the day. A reciter of fabliaux was called *fableor* (pl. *fablière*), in contradistinction to the *chanteor* or singer proper. The province of the *fableor* included also the *Romans d'aventure*, in short, rhyming couplets, the *Contes* a shorter class of narratives, and the *Dits* or sayings. As the fabliaux were distinguished from these classes of poems by the character of their subject-matter, which was drawn from the real world and every-day life; so their treatment of it was more anecdotic and epigrammatic, and marked with strokes of malicious wit. To the epic poems and their ideal life the fabliaux stood forward in direct opposition, their arms being irony and parody. The character of the French people here distinctly manifested itself, and that opposition of the real to the ideal, of the reason to the fancy, of the civil to the ecclesiastical and chivalric, which marks French literature from the time of Francis I. The fabliaux lashed not only the clergy and nobility in their degeneracy, but even mocked the religious chivalrous spirit, and the religions and knightly doctrines and ceremonies. Thus Rutebeuf, one of the most productive fableors of the time of Louis IX. and Philip IV., was in every respect a genuine child of Paris, and may be looked upon as a prototype of Villon, Lafontaine, or Voltaire. The best collections of Fabliaux and Contes are those of Barbazan (enlarged by Méon, four vols. Paris, 1808), Méon (two vols. Paris, 1823), and Jubinal (two vols. Paris, 1839–43).

FABRE D'EGLANTINE, PHILIPPE FRANÇOIS NAZAIRE, a French dramatic writer, was born at Carcassonne in 1755. As early as his sixteenth year he wrote a poem (L'Etude de la Nature) for the prize offered by the French Academy, 1771. Having afterwards gained the prize of the Eglantine in the Floreal games at Toulouse, he assumed the name of that flower as a surname. He now wrote several theatrical pieces, of which however only two, L'Intrigue épistolaire and the Philinte de Molière, were successful. The latter is still considered one of the best character-pieces of the modern French stage. He engaged with ardour in the revolution, acting with Danton, Lacroix, and Camille Desmoulins. Having been chosen deputy from Paris to the national convention, he at first supported moderate principles, but afterwards voted for the death of Louis XVI. without appeal, and was chosen a member of the committee of public safety. He afterwards became suspected by the Jacobins, was accused of falsifying a decree of the national convention relative to the liquidation of the old French East India Company, and being condemned to death was executed along with his colleague Danton April 5, 1794.

FABRETTI, RAFFAELE, an Italian antiquarian, was born in 1618 at Urbino, in the Papal dominions. Having early gone to Rome, where his elder brother Stephen, a respectable lawyer, was residing, he conceived a fondness for those studies in which he afterwards gained so much fame. He was sent to Spain by the cardinal Lorenzo Imperiali with an important public commission; after the successful termination of which he was made Papal treasurer by Alexander VII., and, soon after, auditor of the Papal legation at the court of Madrid. He was subsequently counsellor of appeals in the Capitoline court of justice, legal counsellor to Cardinal Cesi, legate of Urbino, and finally superintendent of the archives in the castle of St. Angelo, which office he held till his death in 1700. The latter part of his life was spent at Rome in antiquarian pursuits. Among his writings may be mentioned De Aquæductibus veteris Romæ, De Columna Trajani, and Inscriptionum Antiquarum Explicatio, in the last of which much light is thrown on the discoveries made by himself in the Catacombs.

FABRIANO, a city of Italy, 36 miles west-south-west of Ancona, and in the province of that name, at the foot of the Apennines, with a cathedral, some fine churches, several convents, and manufactures of felt-cloth, paper, parchment, and glue. Pop. 5699.

FABRICIUS, CAIUS (with the cognomen LUSCINUS), a pattern of ancient Roman virtue in his fearlessness, integrity, moderation, and contempt of riches. After having conquered the Samnites and Lucanians, and enriched his country with the spoils, of which he alone took nothing, he was sent on an embassy to Pyrrhus, king of Epirus, to obtain the ransom of some Roman prisoners. Pyrrhus wished to bribe Fabricius, with whose poverty he was acquainted, by large presents. But the honest Roman refused them. As little was he moved by the sight of an elephant which Pyrrhus, to try his firmness, had concealed behind a curtain, and suddenly exhibited to him in a threatening posture. Pyrrhus dismissed him with admiration, and permitted the prisoners to go to Rome to celebrate the approaching Saturnalia, on a promise that they would return after the festival, which they faithfully kept. The king was so charmed with the conduct of Fabricius that he offered him the highest post in his kingdom if he would attach himself to him after the conclusion of peace; but he independently refused the offer. When consul (279 B.C.) Fabricius delivered up to Pyrrhus his treacherous physician who had offered to poison his royal master for a sum of money. In gratitude for the service the king released the Roman prisoners without ransom. In the year 279 B.C. the battle at Asculum was fought, in which Pyrrhus was victorious, but lost the best part of his army. 275 B.C. Fabricius was chosen censor with Æmilius Papus, and removed Cornelius Rufinus from the senate because he had 10 lbs. of silver plate. Fabricius

was so poor at his death that his daughter received a marriage portion from the public treasury. To honour him even in death, the law of the twelve tables, which prohibited all burials in the city, was suspended in his case.

FABRICIUS, GIROLAMO, an Italian physician, born at Aquapendente in 1537. He studied at Padua under the celebrated Fallopius, whom he afterwards succeeded in the anatomical chair, and had Harvey, the discoverer of the circulation of the blood, for a pupil. Our distinguished countryman acknowledges that the discovery of the valves in the veins made by his master put him on the way of his discovery. During the lifetime of Fabricius his merit was fully recognized by the public and the state. He retired from public life loaded with honours and wealth, and died at the age of eighty-two. His works, which were considered as of the highest authority, were collected and published by Bohnius (Leipzig, 1687).

FABRICIUS, JOHANN ALBRECHT, a celebrated German scholar, was versed in almost every department of human knowledge, particularly in philology and ancient literature, and understood the art of using these stores of erudition to the greatest advantage. He was born at Leipzig in 1668, where he studied philosophy, medicine, and theology, and was afterwards made professor of rhetoric and moral philosophy in the gymnasium at Hamburg. In 1719 the landgrave of Hesse-Darmstadt offered him the first professorship of theology at Giessen, and the superintendency of the Lutheran parishes in his domains; but the authorities of Hamburg retained him in that city by enlarging his income, and he continued to reside there till his death in 1736. His work on Greek literature is a model of profound, various, and comprehensive erudition. This is his Bibliotheca Græca, improved by Harless. No less useful are his Bibliotheca Latina, Bibliotheca mediæ et infimæ Ætatis, Bibliotheca Ecclesiastica, and Bibliotheca Antiquaria. Besides these his edition of Sextus Empiricus, and his remarks on Dion Cassius, evince the depth and extent of his learning.

FABRICIUS, JOHANN CHRISTIAN, one of the most celebrated entomologists of the eighteenth century, was born at Tundern in the duchy of Schleswig, 1748. After he had finished his academic course at Copenhagen, at twenty years of age, he pursued his studies at Leyden, Edinburgh, and Freiburg, in Saxony, and under Linnæus at Upsal. Few scholars of that great man profited more by his instructions. His works upon entomology show, evidently, the principles, the method, and even the forms of expression, peculiar to Linnæus, applied to the development of a new, happy, and fruitful train of ideas. Nor did he attempt to conceal how much he owed his master: he has left to posterity perhaps the most important part of the existing materials for a complete biography of that great student of nature. From his intercourse with him he derived his first notions of his system of arranging insects according to the organs of the mouth; and he endeavoured to persuade Linnæus to make use of it in the new edition of his Systema Naturæ, which he, however, declined doing. Fabricius obtained soon after the situation of professor of natural history in the University of Kiel, and from this time devoted himself entirely to his favourite study. In 1775 appeared his System of Entomology, which gave to this science an entirely new form. Two years afterwards he developed in a second work the characters of the classes and orders, and demonstrated in the *prolegomena* the advantages of his method. In 1778 he published his Philosophia Entomologica, written upon the plan of the well-known Philosophia Botanica of Linnæus. From this time till his death, during a period of thirty years, he was constantly occupied in extending his system, and in publishing it, under various forms, in works of different titles. He was appointed counsellor to the King of Denmark, and professor of political and rural economy. He died March 3, 1808, in consequence, it is said, of grief at the bombardment of Copenhagen by the British, and the misfortunes of his country.

FABRONI, ANGELO, a celebrated Italian biographer, born at Marradi, in Tuscany, 1732. He was educated at Rome, in the College of Bandinelli, where he studied logic, physics, metaphysics, and geometry, and wrote the life of Clement XII. Being supported and encouraged in his studies he conceived the idea of writing the lives of the Italian literati of the seventeenth and eighteenth centuries, and devoted himself with the most active zeal to the execution of this work, the first volume of which appeared in 1766. He died in 1803. The best edition of his Lives (Vitæ Italorum Doctrina excellentium qui Sæculo XVII. et XVIII. floruerunt) is the Pisa edition of 1778–99, eighteen vols. The nineteenth and twentieth volumes were added after his death, one of them containing his own life up to 1800. This work, containing 167 biographies, is one of the best in its kind.

FABRONI, GIOVANNI. See FABRONI.

FAÇADE is the outside or external aspect of an edifice. As in most edifices only one side is conspicuous, viz. that which faces the street and usually contains the principal entrance, this has been denominated, *par eminence*, the *façade*. As a work of architecture it must form a whole, of which all the parts are properly related and symmetrically arranged, and correspondent to the character or style of the edifice. See ARCHITECTURE.

FACCIOLATI, JACOPO, an Italian philologist, was born at Toregia, near Padua, in 1682. The talent discovered by him when a boy caused the Cardinal Barbarigo to place him in the seminary at Padua. Here he became, in a few years, doctor in theology, professor of this science as well as of philosophy, and finally, prefect of the seminary and director-general of studies. He devoted the greatest attention to reviving the study of ancient literature; and, for the promotion of this object, he undertook a new edition of a dictionary in seven languages, which was called the *Calepin*, from the name of its author, the monk Ambrosius Calepinus. His pupil, Forcellini, assisted him in the undertaking, and the work was completed in two vols. folio, between the years 1715 and 1719. He now, in company with his industrious disciple, conceived the idea of a Latin lexicon, in which every word, with all its significations, should be contained and illustrated by examples from the classical writers, after the manner of the dictionary of the Cruscan Academy. This immense undertaking occupied them both for nearly forty years. Facciolati directed the work, which was almost entirely executed by Forcellini. With the same assistant and some others he superintended a new edition of the lexicon of Schrevelius and the Lexicon Ciceronianum of Nizoli. He left many Latin discourses which are characterized by their Ciceronian elegance of style, but differ from their model by a precise brevity. He also completed the History of the University of Padua, which had been brought down to 1740 by Pappadopoli. He died 1769.

FACE, the front part of the head, the seat of most of the senses, is composed of the forehead, the eyelids and eyebrows, the eyes, the nose, the cheeks, the mouth, the lips, the jaws, the teeth. Beneath the skin, which, in the face, is more delicate, more soft, more sensitive and clear than in other parts, are numerous muscles, by which the motions of the skin

are produced. They are enveloped in fat. There are also a greater number of vessels and nerves in the face than in any other external part. Underneath these is the bony basis, which, exclusive of thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the *bones of the face*. The anterior part of the skull (*os frontis*) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the basis of the skull. The other bones are firmly joined together and incapable of motion. The character of each individual is always marked, in some of its traits at least, by the conformation of the countenance, and this has given rise to the art of physiognomy, which has always existed. But though physiognomy, has always to some extent more or less consciously guided the actions of men in their intercourse with each other, and has dictated the descriptions of poets, who assign to their heroes features in keeping with their characters, neither it nor phrenology can be recognized as resting on a scientific basis. The expression of the face depends on the configuration of its skeleton, on the amount of fat in which the muscles are embedded, and on the strength of the muscles themselves. But the natural expression may be modified by disease of remote, even of unsuspected organs, and by habitual concentration on particular actions, while the influence of education and religion may render the character utterly dissimilar to that suggested by the expression. (See PHRENOLOGY and PHYSIOGNOMY.) In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. This conformation gave rise to the theory of the *facial angle*, brought forward by Peter Camper, who seeks to establish a connection between the magnitude of this angle and the intelligence of different animals and men, maintaining that it is always greater as the intellectual powers are greater. Suppose a straight line drawn at the base of the skull, from the great occipital cavity across the external orifice of the ear to the bottom of the nose. If we draw another straight line from the bottom of the nose, or from the roots of the upper incisors to the forehead, then both lines will form an angle which will be more acute the less the shape of the face, in brutes, resembles that of men. In apes this angle is only from 45° to 60°; in the skull of a negro, about 70°; in a European, from 75° to 85°. In many of the Grecian works of statuary this angle amounts to 90°; in statues of Jupiter and Apollo it is 100°. The measurement now adopted by anatomists is more precise. From the anterior end of the sphenoid bone two lines are drawn, one to the foramen magnum, the other to the most anterior point of the upper jaw. The angle included between these, which varies in man from 90° to 120°, is more capable of comparison among vertebrated animals than the angle of Camper.

FACHINGEN-WATER (German, *Fachinger Wasser*), a mineral water, from a spring near the village of Fachingen, in Nassau, Germany. The village is not a watering place, little of the water being drunk on the spot. About 400,000 bottles of it are exported yearly. The water resembles Selters, and contains in 16 oz. 32·9 cubic inches of carbonic acid gas, and 38·39 grains of solid matter, consisting chiefly of bicarbonate of soda, with some lime and magnesia and chloride of sodium, and much smaller quantities of iron, strontia, lithia, phosphatic acid, and fluorine. It belongs to the class of acidulo-alkaline waters, and is used in diseases of the kidneys and bladder.

FACIAL ANGLE. See FACE.

FACSIMILE (from the Latin root *fac*, make, and *simile*, similar), an imitation of an original in all its traits and peculiarities; a copy as accurate as possible. Thus facsimiles of old manuscripts, or of the handwriting of famous men, or of interesting documents, are made in engraving or lithography. The making of facsimiles has been much facilitated by photography. The object of facsimiles is various; in the case of old manuscripts they are intended to show the age of the MS. by the nature of the characters. See MANUSCRIPT.

FACTOR, in arithmetic, is any number which is multiplied by another: thus 7 and 4 are the factors of 28. They are divided into simple and composite. A simple factor is one which is divisible only by itself.

FACTOR, in commerce, an agent employed to do business for another in buying or selling, or in the charge of property. A factor seems to differ from a broker in holding a wider and more discretionary commission from his employer; but the difference depends upon the usage of the particular trade, or upon the special instructions constituting the agency, and no exact line of demarkation can be drawn between them. The term factor has in common usage generally given place to the terms agent and broker, the former applied in the more general, the latter in the more restricted sense. It is still retained in some special cases, as in that of house factors and factors on landed property in Scotland, who have charge of the letting and general management of house property, farms, &c.; called in England estate agents. The use of the term factor seems at one time to have been specially applied to the foreign agents intrusted with the sale on commission of goods on consignment, now called consignees or commission agents. The distinctions between a factor in this sense and a broker laid down in law books do not hold good in practice for the reason that the theoretical boundaries between the two kinds of agency are not observed. It is said that a factor is intrusted with the possession of goods; is entitled to sell them as if they were his own, and holds a lien on them for outlay, &c. A foreign agent is at liberty to use his discretion in selling goods if he has no special instructions, but he is not at liberty to violate his instructions; a broker, on the other hand, has frequently goods consigned to him for sale, and even makes advances on them, when he certainly holds a lien on them for his outlay. A broker is bound to hand over any cash he receives at once to his principal, an agent is bound to follow his instructions in remitting it. Again, a foreign agent does not usually give up the names of his customers to his principal as the broker does; and he usually guarantees their solvency, for which he receives a special commission, and which the broker does not do; but if the agent becomes himself insolvent the consigner can collect the outstanding debts on his own account, or assert a preferable claim to them if collected by the trustee of the insolvent, just as if they were sold by a broker. The term factor may, indeed, be regarded as merely synonymous with agent, while functions implied in it, and those of brokerage, are frequently combined in the same person and in the same transaction. See AGENT and BROKER.

FACTORY (from *factor*) appears originally to have been used for a depot of goods in a foreign market under the charge of a factor; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry resulting from the free use of machinery, and the consequent subdivision of labour, the advantages of which are so well illustrated by Adam Smith in the first chapter of his Political Eco-

nomy. The factory system, like most great organizations, has its drawbacks as well as its advantages. By increasing production it tends to diminish the hours of labour, but this tendency is counterbalanced by the enormous and often extravagant expenditure to which the increased productiveness of labour gives rise. By bringing workmen together it affords them opportunities of higher cultivation, but this also is frequently counterbalanced by the smaller amount of independent intelligence called forth in the individual worker through the monotony of the minutely subdivided operations of production. Perhaps the worst symptom of the ultimate tendency of the factory system is its constantly increasing demand on the labour of women and children, interfering as it does with the economy of domestic life, and adding a formidable complication to the already formidable difficulties of education. This tendency plainly indicates that increased productiveness does not necessarily imply increased facility in procuring the means of subsistence. Wherever there is increased productiveness increased population is on the march to overtake it, and the absorption of the labour of the more dependent part of the community does not show that it is far distanced in the race.

FACTORY ACTS. Considering that women and children were not qualified fully to protect themselves against the strain of competition, the British legislature has from motives of humanity passed a series of acts to regulate the conditions of their employment in factories, which are commonly known by the above title. Act 1 and 2 William IV. cap. xxxix., 15th October, 1831, after repealing a previous act on the subject, enacts that no person under twenty-one shall work between half-past eight evening and half-past five morning in any cotton mill or factory worked by steam; hours of labour limited to twelve daily and nine on Saturdays. An hour and a half are to be allowed for meals. No child under nine to be employed. Act 3 and 4 William IV. cap. ciii., 29th August, 1833, refers to children. It recites a larger number of factories, reduces the age at which prohibition begins to eighteen, and makes some exceptions; the hours of labour are fixed at sixty-nine weekly, the allowance for meals being the same. Act 7 Victoria, cap. xv., 6th June, 1844, gives power to an inspector to enter every part of a factory, or a factory school, and to take with him the certifying surgeon of the district, and a constable or peace officer; gives him power to examine any persons employed in a factory regarding the provisions of the act, and to require them to sign declarations, power to examine registers kept under the provisions of the act, &c. It establishes an office of factory inspectors in London, to which any person starting a factory must send notice of the details of his undertaking required for the working of the Act. It contains regulations for the appointment of surgeons, and some provisions as to the use of machinery, &c. Children of eight to thirteen years of age with a surgeon's certificate may be employed in factories for six and a half or seven hours daily, or for ten hours on alternate days, certificates of school attendance being required from children so employed. Females above eighteen are to be employed in factories only for the same time and manner as young persons. (See 3 and 4 William IV. cap. ciii.) Lost time may be recovered at a rate not exceeding one hour each day. Intervals for meals are provided for, and eight half-holidays are to be given yearly. The Act 10 Victoria, cap. xix., 8th June, 1847, alters the two previously cited acts in regard to the limit of time fixed for the employment of women and children, that limit after 1st May, 1848, to be not more than ten hours daily, or fifty-eight hours weekly. 13 and 14 Victoria, cap. liv., 5th August, 1850, repeals the regulations of the previous acts in regard to the hours of labour, and enacts that no female or young person under eighteen shall be employed in any factory before six in the morning or after six in the afternoon; the meal hours to be taken between half-past seven in the morning and six in the afternoon. Work may be continued up to seven to recover lost time. 16 and 17 Victoria, cap. civ., Aug. 20, 1853, permits seven A.M. to seven P.M. to be substituted for six A.M. to six P.M. between 30th September and 1st April. Act 23 and 24 Victoria, cap. lxxviii., 6th August, 1860, regulates the employment of females and young persons in bleaching and dyeing works. Act 24 and 25 Victoria, cap. cxvii., 6th August, 1861, places lace factories under the factory act, with one or two special regulations. Act 25, Victoria, cap. viii., 11th April, 1862, extends the means of enforcing the factory acts to the bleaching act. 27 and 28 Victoria, cap. xlviii., July 25, 1864, extends the provisions of the factory acts to manufactories of earthenware (except bricks and tiles), lucifer matches, percussion caps, cartridges, paper-staining, fustian-cutting. Regulations as to the cleaning, &c., of factories are extended. By 30 and 31 Victoria, cap. ciii., 15th August, 1867, the factory acts are extended to blast-furnaces, copper-mills, forges, foundries, manufactories of machinery, metal, india-rubber, gutta-percha, paper, glass, tobacco, letter-press printing, bookbinding, and all other works in which more than forty-nine persons are employed, with exceptions as to night work in blast-furnaces, iron-mills and printing-offices. Act 33 and 34 Victoria, cap. lxii., 9th August, 1870, extends the act of 1867 to print-works, bleach-works, and dye-works. Special regulations are made for Turkey-red dyeing works. In the curing and preserving of fish, women may be employed between 1st June and 14th December for fourteen hours per day.

FACULTIES, COURT OF, in English law a jurisdiction or tribunal belonging to the archbishop. It does not hold pleas in any suits, but creates rights to pews, monuments, and particular places and modes of burial. It has also various powers under 25 Henry VIII. cap. xxi., in granting licenses of different descriptions, as a license to marry, a faculty to erect an organ in a parish church, to level a churchyard, to remove bodies previously buried (Wharton's Law Lexicon).

FACULTY, in law, is a power to do something, the right to do which the law admits, or a special privilege granted by law to do something which would otherwise be forbidden. See FACULTIES (COURT OF).

FAECES, the excrementitious part evacuated by animals. It varies, of course, with different species of animals, according to their diet, but it also varies with the individual, although the average character is tolerably constant. The main constituents are morphological elements more or less disintegrated from the walls and passages of the alimentary canal; unassimilable parts of the food on which the digestive process has no effect; and other portions quite nutritious but which have escaped digestion, minute traces of biliary matter, and a large proportion of inorganic salts and water. In disease the composition varies extremely, and mercury, iron, and other drugs administered as medicine are easily detected. By treatment with water, alcohol, &c., various substances have been extracted, of which *excretin*, a crystalline solid, said to contain sulphur, is the best known.

FAENZA, a town in the Kingdom of Italy, in the province of, and 19 miles south-west of the town of Ravenna. It is well-built, being in the form of a square, divided by four principal streets, which meet in the Piazza Publica, containing the town-hall,

cathedral, and a lofty tower. It is surrounded by arcades, and has fountains in the centre. The cathedral is a Gothic building, not remarkable for beauty. Faenza is supposed to have been the first Italian city in which earthenware was introduced; hence *Faience* (which see). The manufacture still flourishes here, and there is also a considerable trade in spinning and weaving silk. Faenza is connected with the Adriatic by the Zanelli Canal, opened in 1782. There are in the neighbourhood ferruginous and saline springs of considerable repute. Torricelli was born here. Faenza is a town of considerable antiquity, and, like most Italian places, it has had a checkered history. It has been frequently subjected to the fluctuations of party and the fortunes of war during the whole period of Guelf and Ghibelline controversy, and of alternate French, German, and Spanish occupation. Pop. 36,299.

FAGEL, a Dutch family which has given to the United Provinces a series of able statesmen and warriors, among whom we may mention as being most distinguished:—

1. Gaspar Fagel was born at the Hague in 1629, and died there 15th December, 1688. In 1663 he was made pensionary of Haarlem, and through the influence of the brothers De Witt, registrar to the States-general in 1670. After the murder of the De Witts (20th August, 1672) Gaspar was appointed to succeed Jan de Witt in the office of grand pensionary, which he held till 1688. He was from principle a close and steadfast adherent of William, prince of Orange, and a zealous supporter of his enterprises against France. In 1675 he persuaded the estates of Guelderland to offer the sovereignty of that duchy to William, who accepted only the stadtholdership. He was one of the negotiators on the part of Holland in the Peace of Nimeguen, to the conclusion of which he appears to have been personally opposed, and he resisted the endeavours, and it is said the bribes, of D'Avaux, the French ambassador, to bring him over to the side of Louis. He also used his influence against the treaty concluded in 1684 between France, Spain, and Germany. It was better, he said, to die, than fall into the hands of Louvois, or of the French lackeys sent to levy tribute. He contributed, as much as his position enabled him to do, to the enterprise of William upon England, and prepared the expedition by which he was enabled to take possession of the crown, although he did not live to witness the success of the undertaking.

2. Frans Nicolaas, nephew of Gaspar, entered the military service in 1672, and died 1718, general of infantry in the service of the States-general, and imperial lieutenant field-marshal. He distinguished himself in the battle at Fleurus, 1690. The famous defence of Mons, 1691, was directed by him. He also displayed great military talent at the siege of Namur, at the capture of Bonn, and in Portugal, 1703, in Flanders, 1711 and 1712, at the battles of Ramillies (1706) and Malplaquet (1709). Several other members of the family have held the office of registrar to the States-general, ambassador, or other important posts.

FAGGING, a custom which formerly prevailed generally at most of the English schools, and is still practised at Eton, Winchester, and one or two other places. It consists in making the junior boys act as servants or 'fags' in the performance of multifarious menial offices for the elder boys. It has been upheld by some as exerting a beneficial influence in disciplining boys and rendering them hardy and self-reliant; but in many cases it must tend to foster an arbitrary and tyrannical spirit on the part of the elder ones, and a craven submissiveness and servility on that of the juniors. Some well-authenticated instances of fearful cruelty to fags are recorded, and it is to be hoped that ere long the institution will be entirely abolished, as the relic of a barbarous age. Under Pennalism will be found a notice of similar practices in German universities.

FAGGÓT-VOTE is a vote procured by the purchase of property under mortgage, or otherwise, so as to constitute a nominal qualification without a substantial basis. Faggot-votes are chiefly used in county elections. The way in which they are usually manufactured, namely, by the purchase of a property which is divided into as many lots as will constitute separate votes, and given to different persons, has given rise to the name. Sometimes properties are bought in this way, and held as a bona-fide investment for the sake of the vote.

FAHLCRANZ, Karl Johann, one of the most famous Swedish landscape-painters, was born in 1774, at Sprengel, Stora-Tuna, in the län of Falun, where his father was pastor, and studying nature diligently became a self-educated artist. He was acquainted only with northern scenery, but has given it with great fidelity and spirit. His principal productions are in the possession of the King of Sweden. He died 1st January, 1861.

FAHLERZ. See Copper—*c.* The Gray Copper, Fahlerz, or Tetrahedrite.

FAHRENHEIT, Gabriel Daniel, known for his arrangement of the thermometer and barometer, was born at Dantzig, May 14, 1686, and was originally designed for the commercial profession. His inclination for natural philosophy induced him to quit that business, and having travelled through Germany and England to enlarge his knowledge, he settled in Holland, where the most celebrated men in this branch of science, s'Gravesande and others, were his teachers and friends. In 1720 he first conceived the idea of using quicksilver instead of spirits of wine in thermometers—a discovery by which the accuracy of the instrument was very much improved. He took, as the limit of the greatest cold, that which he had observed at Dantzig in the winter of 1709, and which he could always produce by mixing equal quantities of snow and sal-ammoniac. The space between the point to which the quicksilver fell at this temperature, and that to which it rose in boiling water, he divided into 212 parts; and this distinguishes his scale from Réaumur's and the Centigrade. (See Thermometer.) He gives an account of it in the Philosophical Transactions for 1724. This paper also contains the first notice of the fact that water can be cooled much below its freezing-point without becoming solid. About 1724 he discovered the fluctuation of the boiling-point of water, which he had made one of the fixed points of his thermometer. He was chosen a fellow of the Royal Society of London in 1724. He died September 16, 1736.

FAHRENHEIT SCALE. See Thermometer.

FAIENCE, Imitation Porcelain, a kind of fine pottery, superior to the common pottery in its glazing, beauty of form, and richness of painting, and of which several kinds are distinguished by critics. It derived its name from the town of Faenza, in Romagna, where it is said to have been invented in 1299. A fine sort of pottery was manufactured there at that period, which the Italians called *maiolica*, whether from its inventor, or because originally it came from Majorca, is doubtful. Some pieces were painted by the great artists of the period, and are highly valued as monuments of early art. The *maiolica* reached its greatest perfection between 1530 and 1560. In the Louvre, at Berlin, and at Dresden are rich collections of it. The modern faience appears to have been invented about the middle of the sixteenth century, at Faenza, and obtained its name in

France, where a man from Faenza, having discovered a similar kind of clay at Nevers, had introduced the manufacture of it. Another derivation of the term is from Fayence, a small town in Provence, famous for the manufacture of this kind of ware before the Nevers and Paris manufactories had been founded. Towards the end of the seventeenth century the city of Delft, in Holland, became famous for the manufacture of faience, which was called also *delft-ware*. It does not, however, resist fire well. The English stoneware has some resemblance to faience, but is, in reality, entirely different. True faience is made of a yellowish or ruddy earth, covered with an enamel which is usually white, but may be coloured. This enamel is a glass rendered opaque by oxide of tin or other suitable material, and is intended not only to glaze the body, but to conceal it entirely. It was to the independent discovery of the glaze, which he had seen on some specimens, that Bernard Palissy devoted himself, and in the course of which he suffered so much that his own narrative of it is as interesting as a romance. See POTTERY.

FAILURE. See BANKRUPT.

FAIRFAX, EDWARD, a poet of the seventeenth century, who is regarded as one of the great improvers of English versification. He engaged in no profession, but, settling at Newhall, in the parish of Fuyistone, in Knaresborough Forest, led the life of a retired country gentleman, devoted to literary pursuits. The time of his death is uncertain; it is said to have been about 1632. Fairfax's reputation rests on his version of Tasso's Jerusalem Delivered, first published in 1600. It is written in the same stanza with the original, and combines fidelity to the sense of the author, with harmony of versification. After being for a while superseded in the estimation of the public by the inferior translation of Hoole, it has been more justly appreciated, and recent editions of it have issued from the press. Fairfax wrote eclogues and other poems not known to be extant, except one of the former inserted in Mrs. Cooper's Muses' Library. He also wrote in prose on demonology, in which he was, it seems, a believer.

FAIRFAX, THOMAS, LORD, a distinguished commander and leading character in the civil wars which distracted England in the seventeenth century. He was born in 1611, at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648. A strong predilection for a military life induced him to quit Cambridge, and at an early age to volunteer with the Lord Vere, under whom he served a campaign in the Netherlands with some reputation, and whose daughter he afterwards married. When the disputes between Charles I. and the Parliament terminated in open rupture, Fairfax warmly espoused the cause of the latter, and joined his father in making active preparations for the approaching contest. In April, 1642, he presented to Charles at York a petition of the people imploring him to be reconciled to his subjects. The same year he was appointed general of the horse, and he served under the Earl of Manchester at Winceby, 11th October, 1643. In 1644, together with Essex, Waller, and Manchester, he held a chief command in the English army sent to co-operate with the Scots. He defeated Colonel Wetherby, and formed a junction with the Scots on 20th April. The credit of the battle of Marston Moor has, by some authorities, been divided between Leslie and Cromwell, but, according to others, Fairfax is also entitled to share in it. At all events, on the Earl of Essex resigning the command of the parliamentary army in 1645, Fairfax was made general-in-chief in his room. He insisted on the command of the horse being given to Cromwell. After the victory at Naseby, to which Cromwell, with his ironsides, again mainly contributed, he marched into the western counties, quelling all opposition as he advanced. When he took Oxford the first thing he did was to set a guard upon the Bodleian Library, an act which sufficiently indicated his opinion of his followers, and for which he deserves the gratitude of posterity. He subsequently, in November, 1647, was engaged with Cromwell in putting down the levellers in the army, and in the following year put down the insurgents in Kent and Essex; captured Colchester, and caused Sir Charles Lucas and Sir George Lisle to be tried by court-martial and shot. When the king fell into the power of the prevailing party, considerable jealousy appears to have been entertained by Oliver Cromwell and his adherents of Fairfax, who seems to have been far from wishing to push matters to the extremity to which they afterwards went. Nevertheless he still adhered to the party with which he had hitherto acted. In April, 1649, he was again occupied, with the co-operation of Cromwell, in suppressing revolt in the army. But, being ordered to march against the Scottish Presbyterians, he positively declined the command, notwithstanding the urgency of Cromwell, who declared that he would rather fight under him than command the greatest army in Europe, and Cromwell was appointed (26th June, 1650) to succeed him. He was appointed one of the lay church commissioners in 1654, and was a member of Cromwell's first Parliament. He assisted Monk against General Lambert, and co-operated in the restoration of Charles II., being one of the committee charged to secure his return. He died at Nun Appleton, 12th November, 1671.

FAIRIES, FAIRY TALES, ELVES, &c. Every child knows that fairies are a kind of good and bad spirits. The former are usually the most beautiful women in the world, the latter the most hateful monsters. They are often found present by the cradle, or in the decisive moments in life, to influence the fate of the individual. They have great power, united with great knowledge, and their wands work wonders. Still, both their knowledge and power are limited, as is also their free agency; they can only act under certain circumstances, which it is not in their power to control, for more powerful than fairy or magic influence is the mysterious working of fate. Who has not felt a desire to solve the riddle of the sometimes almost miraculous concatenation of events in life by the agency of these active sprites, and to embody the invisible agents of nature in visible forms? In an age of ignorance the imagination easily substitutes a poetical mythology in the place of natural causes. The native land of this fairy mythology is Arabia, from whence it was brought to Europe by the Troubadours. The European name *fairy* comes from *fatum*, fate. The Italians still call a fairy *fata*. Fairies are often mentioned in the traditions of the Italians, who, as well as the Arabians, had stories of a country inhabited by fairies. The poetical treatment of the fairy world was introduced into France in the twelfth century by the poem of Lancelot of the Lake. This work increased the liking for fairy legends not only in France but also in foreign countries, a task which Philip, count of Flanders (1191), contributed not a little to extend. The higher classes believed their existence as described in romances; the people saw them everywhere, but particularly in ruined castles, or such as were surrounded with forests (the fairy Melusine ruled in the castle of Lusignan); but they also dwelt around fountains and trees. They played an important part in the romances of chivalry and the *fabliaux*, and gave them a peculiar charm; they constituted their ma-

chinery, and the romantic epics of Boiardo, Ariosto, Tasso, and others, are not a little indebted to them. They were naturalized in England before the time of Chaucer and Spenser; and tales of their doings were so widely spread, and so fixed in the popular belief, that they did not appear extraordinary or unnatural when brought upon the stage by Shakspeare. They were easily reconciled with the Christian doctrine of good and evil spirits, and Tasso, in his Jerusalem Delivered, attempted to reduce to a poetical system these spiritual beings, partly Christian and partly heathen. In the last part of the seventeenth century the true fairy tales first became popular, and here also the Italians appear to have taken the lead. The Pentameron, by Basilio, enlarged by Alessio Abbatutis, led the way. In 1667 circumstances connected with the private history of Louis XIV. brought these tales into vogue in France, after the revocation of the Edict of Nantes, 1685; and after Perrault had published the Contes de ma Mère l'Oye, in 1697, he was immediately imitated by a multitude of authors. The learned orientalist, Antoine Galland, appears to have been led to translate the Arabian Tales, the Thousand and One Nights (see ARABIAN NIGHTS), which appeared in 1704, by the prevailing love for fairy tales. The popularity of the fairy tales appears from the multitude of similar stories which have since appeared. The best have been collected in the Cabinet des Fées (Paris and Geneva, 1786, thirty-seven vols.), the last volume of which contains an account of the authors. The principal critics of Boileau's school, who ranked judgment higher than imagination, set themselves vehemently against them; but they continued to be fashionable till satiety produced disgust. It then began to be seen that Hamilton, who wrote such excellent fairy tales himself, might have been in the right in his ridicule of them. See GNOME and KOBOLD.

FAIRS and PERIODICAL MARKETS (French, *foire*, German, *Messe*). A fair is a periodical meeting of merchants in an open market held at a particular place, and generally for the transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. Fairs are generally held in or near towns, but from their nature are specially adapted to the convenience of country dealers and their customers.

Two curious facts are to be noted in the history of fairs. In Europe the numerous festivals of the church afforded the most favourable opportunity for the establishment of these markets. This association is indicated in the German name of a fair, which is identical with that used for the ceremony of the mass. A fair generally brings a concourse of people into the town in which it is held, and gives it something of a holiday appearance. Advantage has frequently been taken of this concourse, either by the persons assembled themselves or by the purveyors of various amusements, to add entertainment to business, and as the business of a particular fair declined it has often, instead of being abandoned, been gradually converted into a periodical opportunity for a saturnalia of amusement. Thus religion, business, and diversion have come to be associated in the idea of a fair. Fairs were formerly of more importance than they are now. Modern facilities of communication and correspondence, and the innumerable army of agents through whom all business negotiations are now conducted, have diminished the necessity for periodical markets, but there are still a few classes of merchandise, chiefly connected with agriculture, in which they retain, and are likely to retain, their importance. A periodical visit to town is so obvious a convenience to country people, and that convenience is so much enhanced by a number making that visit simultaneously, that there is reason to believe that this class of fairs will not be done away with. It is, however, curious to observe that they have never been established in America; a fair there is equivalent either to an agricultural exhibition or to a ladies' fancy bazaar.

In the middle ages fairs were specially privileged and chartered by princes and magistrates, special temporary tribunals were even established for their use. It was then the custom, which in some places still remains, to make a public proclamation of the commencement and duration of the fair. The goods sold at fairs were then of much greater value, as well as variety, than at present, embracing fabrics of all kinds, as well as jewelry. In some parts of the Continent the practice still prevails of purchasing clothing at fairs. Fairs existed in ancient as well as modern times, and are to be found in all parts of the world. In the East they are of great magnitude and importance. At Mecca, during the annual pilgrimages, and at Hardwar in Ajmîr, a resort of pilgrims in Hindustan, two of the greatest fairs of the East, we find again the association between commerce and religion. According to Prescott fairs were regularly held in the principal cities of Mexico every fifth day, being the recognized substitute for shops. A fair for the sale of slaves was held at Azcapozales, near the capital. At the principal fair, held at the city of Mexico, the number of visitors reached 40,000 to 50,000. Here the same arrangement prevailed as in the European fairs of the middle ages. A court of twelve judges, clothed with absolute authority, maintained perfect order in this great concourse.

The Easter and Michaelmas fairs at Leipzig, the fairs of Frankfort-on-the-Main, of Lyons in France, and Nijnei-Novgorod in Russia, are among the most important fairs of the present day in Europe. The Leipzig book-fair, a very peculiar institution, is described in our article on the BOOK-TRADE. The fairs of Great Britain now mostly consist of the weekly market-days of country towns, and certain great agricultural meetings, or trysts, as they are called in Scotland, chiefly for the sale of cattle and horses, such as the Falkirk Tryst. There are also, especially in Scotland, a considerable number of hiring fairs. Among the most celebrated of the fairs which have been turned into saturnalia are the celebrated Donnybrook fair in the county of Dublin; Bartholomew and Greenwich fairs, London; and Glasgow fair. The day of these fairs is, however, already past; the tide of modern improvement has long since reached the amusements of the people, and the better means of entertainment now available have taken away the aliment from these ill-organized and tumultuous assemblages. Most of them are already extinct, and all of them are in process of becoming so.

FAIRWEATHER MOUNTAIN, on the west coast of North America, in Alaska Territory, 35 miles north-east of Cape Fairweather, which is in lat. 51° 32′ N.; lon. 68° 55′ W. It is one of the principal summits of the Cordillera of New Norfolk, rising, according to accurate observations, to the height of 14,900 feet above the level of the sea, and is covered with perpetual snow.

FAIRY CIRCLE, or FAIRY RING, a phenomenon frequent in the fields, &c., formerly supposed to be traced by the fairies in their dances. There are two kinds—one of 6 or 7 yards in diameter, consisting of a bare ring or path, a foot broad, with green grass in the middle of it; the other is of smaller dimensions, encompassed with a circumference of grass, greener and fresher than that in the middle. They are

ascribed to a kind of fungus which breaks and pulverizes the soil.

FAITH, a doctrine derived from Scripture, and held generally by all churches or bodies of Christians who acknowledge the divinity of Jesus Christ. The statements on which this doctrine is founded are diffused generally throughout the New Testament, and it is not always easy either to apprehend the exact signification of each or to reconcile them with one another. It would, however, be extremely rash to adopt the view of some modern critics that these views are really inconsistent, that St. Paul, for example, does not hold the same view of faith as St. Peter, or that he developed this doctrine in a way unknown to or unanticipated by our Saviour himself. There are evident points of agreement between the divergent views of faith, between that, for example, which insists on the necessity of works and that which asserts the justifying efficacy of faith alone, seeing that St. Paul, who propounds the latter, says of himself, 'I keep under my body, and bring it into subjection, lest, by any means, after having preached to others, I myself should be a castaway;' and the subject in its own nature is so profound and so extensive that a superficial agreement on it could not fairly be looked for. From the general teaching of the New Testament some salient points may be gathered in regard to the doctrine of faith, which, although they may not comprehend all details or remove all difficulties, will give a general idea of the scope of the doctrine. It is assumed that mankind is in a state of alienation from God; that this arises from a fall from their original position which took place in the person of Adam, their original representative, in consequence of his disobedience in eating of the forbidden fruit; that in this state they are generally prone to what is evil, and even the good they do does not proceed from the right motive, the love of God; that God has designed to raise man from this position by giving him a new head and representative in the person of his only son, Jesus Christ, who for this purpose was sent into this world 'in the fulness of time' to 'fulfil all righteousness,' and to suffer and die 'as a propitiation for our sins;' that individual men are united to Christ by faith as the bond by which they come within the terms of this new covenant. Faith is represented as bringing believers into a vital union and spiritual communion with Christ, like the union of the branch to the vine, or of the members of the body to the head, from which love to God and all good works flow. Faith is preceded or accompanied by repentance, which, as well as faith itself, is the work of the Holy Spirit, the third person of the Trinity.

This is a general outline of what is believed by the great body of Christians, or by the bulk of the churches calling themselves orthodox or evangelical, but it must be allowed that at almost every point not only churches but individual theologians differ as to the definition of terms, and especially as to the extent of meaning to be assigned to them. It is not easy to determine, in particular, to what extent Catholic and Protestant divines agree in respect to faith. The doctrine of justification by faith was made by Luther, and has continued to be, a distinctive one of the Reformation. Historically it is perfectly clear how this took place. Among the innumerable abuses of the Romish Church at this time was the corruption and entire perversion of her doctrine. Out of one of her distinctive principles, that of penance, had grown an enormous practical abuse, that of indulgences. Indulgences were originally only a relaxation of the discipline of the church, a remission for some particular cause of the penance imposed on transgressors. By-and-by it came to be believed that a positive merit existed in the zealous endurance of penance and in the performance of other acts of piety, so that a store of such merit might be accumulated not only sufficient for the individual but ample enough to enable him to impart of it to others. By a convenient fiction this store was transferred to the church, and finally sold like any other article of commerce. It was as a protest against this abuse that Luther drew forth from the dust and rubbish of ages the neglected but not rejected doctrine of justification by faith, and asserted the incompetency of man to perform works of intrinsic merit in the sight of God. It was effectual, and the resuscitated doctrine has since formed, as we have said, a distinctive principle of the Reformation. But this doctrine was in no sense new. It was familiar to the fathers of the church, and was acknowledged, if not without qualification, at least in some form by Catholic theologians before, as it has been since, the Reformation. With such doctrines as those of confession, penance, transubstantiation, and purgatory, it is not possible that this doctrine can hold the same place in the Catholic as in the Protestant communion; but not to speak of Pascal, who was accused of Calvinism, an accusation which he strongly repudiated, such orthodox divines as Bossuet and Massillon write on this subject in substantial harmony with Protestant divines. Bossuet, with that comprehensiveness of view for which he was distinguished, asserts the unity of the faith in all ages. The church before Christ, according to him, looked forward to his coming as the church since has looked back on it as the ground of its faith. Milton, with a higher generalization than Bossuet's, applying the reasoning of St. Paul, unites angels and men, by the bond of faith, in Christ as a common head.

FAKIR, a kind of fanatics in the East Indies, who retire from the world, and give themselves up to contemplation. They endeavour to gain the veneration of the people by absurd and cruel penances. Some roll themselves in the dirt. Others hold an arm raised in one position so long that it becomes withered, and remains fixed in this position for life. Others keep the hands clasped together so long that the nails grow into the flesh, and come out on the other side. Others turn their faces over the shoulder, or their eyes towards the end of the nose, till they become unchangeably fixed in this direction. They make a vow of poverty, and to live at the expense of the faithful. Some of them, however, possess money and land. There are Mohammedan and Hindu fakirs: the number of the former is considerable. The Hindu fakir who has reached a certain stage of perfection becomes *Sanyasis*. This degree of perfection seems to consist chiefly in idleness and dirt; those who have attained it are dispensed even from religious worship. The self-torture to which these wretched devotees submit is almost beyond belief. Besides the penances already mentioned, standing with the hands raised above the head, or in some painful position, for protracted periods—passing between four fires, representing the cardinal points, with a fifth in the middle to represent the sun—dragging heavy chains—living in iron cages—are among the means they adopt of reaching the imagined goal of their devotion. Mendicancy, of course, forms an essential part of their observances.

FALAISE, a town, France, department of Calvados, picturesquely situated on a rocky precipice, 23 miles S.S.E. of Caen. It consists of three distinct parts, the high town, town proper, and suburbs; is surrounded by old walls, and though irregularly and indifferently built, contains several objects of interest, among others the ruined castle of the dukes of Normandy, where William the Conqueror was born. The manufactures are chiefly cotton goods, lace,

leather, and paper; and the trade, chiefly carried on at the six annual fairs, one of which lasts fifteen days, is of considerable importance. Falaise was an important fortress early in the eleventh century, and was frequently besieged and taken, until it was dismantled by Henry IV. in 1590. Pop. 8183.

FALASHAS. See ABYSSINIA.

FALCON. The Falconidæ (or Accipitrinæ) form one of the two divisions of diurnal birds of prey, and include falcons, hawks, and eagles. They have the head and neck covered with feathers. With the exception of the ospreys they have projecting eyebrows, which give their eyes a sunken appearance. The colour of the plumage frequently differs much in the young from that of the full-grown birds, and as their first plumage is retained for some time, this has caused more species to be enumerated than really exist. The female is generally a third larger than the male. Nearly all of them subsist on living prey, but they differ in the boldness of their pursuit of it. Subjoined is a notice of the leading species of the falcons proper. For the other species see EAGLE and HAWK. The falcons proper (genus *Falco*), for strength, symmetry, and powers of flight, are the most perfectly developed of the feathered race. They are distinguished by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The largest European falcons are the jerfalcon or gyrfalcon proper (*Falco gyrfalco*), a native of the Scandinavian Peninsula, and the Iceland falcon (*F. Islandus*); to which may be also added the Greenland falcon (*F. Groenlandicus* or *candicans*), which, as well as the Iceland falcon, has been shot in the British Islands. Between these three species much confusion at one time prevailed, but they are now distinctly defined and described. In the Greenland falcon the prevailing colour at all ages is white, in the Iceland falcon dark—being brown or gray according as the bird is young or old. The former has the upper surface adorned with heart-shaped spots or transverse blotches of black or very dark slate-colour, the head being pure white or slightly streaked; in the latter the dark colour is the ground of each feather, on which the light marking stands out. The latter has also the bill and claws darker. The Iceland falcon more nearly resembles the true gyrfalcon of Norway, but, as a rule, the former has the crown of the head much lighter than the back, while the latter has them both of the same colour, or the crown darker than the back, and the bird altogether is generally darker, rather smaller, but with a longer tail. The average length of any of these falcons may be stated at about 2 feet. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares, and water-fowl. It is found over a wide range of northern territory. The Iceland falcon breeds in Greenland as well as in Iceland. Cranes and herons were considered to furnish the best sport with these large falcons in former times, and they are still sometimes used for catching hares and rabbits. The peregrine falcon (*F. peregrinus*) is not so large as the jerfalcon, but more elegant in shape. The female is about 17 inches long and 3½ feet in extent of wing; the male is 2 or 3 inches less. The head, neck, a patch under the eye, and the whole upper surface is dusky, with gray and brownish shades; the throat and under parts whitish or cream-coloured, with dusky bars and arrow-heads; legs and feet yellow, bill bluish. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, &c. Its flight is exceedingly swift, said to be as much as 150 miles an hour. The peregrine falcon was one of those most frequently used in falconry. Another British falcon is the hobby (*F. subbuteo*). It is a summer visitant to this country, arriving in April. It builds in tall trees, and sometimes it makes use of the deserted nest of a crow or magpie. It haunts the cultivated parts of the country, and its favourite prey is the lark. It is very strong-winged, and was a great favourite for the chase of small game when falconry was in fashion. The upper parts are grayish black, the feathers having lighter margins, the chin and throat white, belly dull orange marked with arrow-head spots, quills dusky black. The merlin (*F. æsalon*) is a beautiful little falcon, and remarkably swift and spirited. It is about 1 foot long, and weighs scarcely 6 oz. It frequents moors, and constructs its nest in rocky places or in a bush. The kestrel (*F. tinnunculus*) is one of our most common falcons. It preys chiefly on mice, beetles, moths, and small birds. It is 2 inches longer than the hobby, but has the same stretch of wings, and its bill and claws are weaker. The female is reddish-brown on the whole of the upper parts, with arrow-head dusky spots on the head, back, and wing-coverts, and dusky bars on the tail, the tips of the feathers being margined with cream-colour. The under parts are reddish cream-colour with dusky lines. One of the peculiarities of the kestrel is its habit of poising itself and hovering almost immovably over a certain spot, whence its popular name *wind-hover*. The *Gampsonyx* is a small Brazilian falcon; and two species of *Hierax*, found in Java and Manilla, are scarcely larger than a swallow, but distinguished for their spirit and energy. The flight of the falcon is very rapid. It rises to a great distance, and darts down perpendicularly on its prey. Hence its use in falconry (which see). The falcons attain to a great age. One is said to have been found in France, about 1790, with a collar of gold dated 1610, showing it to have belonged to James I. of England.

FALCONE, ANCELLO, one of the most distinguished Italian battle painters, was born at Naples in 1600, studied along with Salvator Rosa under Spagnoletto, and afterwards founded for himself an academy, which was numerously attended. Being of a restless and impassioned character he took part in the insurrection of Masaniello, and afterwards became the leading member of a secret association, the discovery of which obliged him for a time to seek an asylum in France. His paintings, consisting chiefly of battle-pieces, are highly esteemed, but very rare. He died at Naples in 1665.

FALCONER, HUGH, botanist and palæontologist, was born at Forres, in Morayshire, 29th February, 1808. He studied arts at King's College, Aberdeen, from 1822–25, and medicine in Edinburgh from 1826–29, taking the degree of A.M. from the former, and of M.D. from the latter university. He received an appointment of assistant-surgeon on the Bengal establishment of the East India Company, but until he had attained the required age of twenty-two he filled up his time with his favourite studies of botany, geology, and palæontology. Immediately on his arrival in India (September, 1830) he examined and reported on a collection of fossil bones from Ava, which gave him a recognized standing among the scientific men of India. In 1832 he was made superintendent of the botanic garden at Saharanpur. He discovered the true geological character of the Sewalik Hills, and by means of it defined their boundaries relatively to the Himalayas in a way which has since been generally received. In order to investigate the ossiferous deposits found there in 1834 by Lieutenants Baker and Durand, he procured skeletons of extant species for comparison. For these researches he received

the Wollaston Medal of the Geological Society of England. He was next engaged in introducing tea cultivation in the northern provinces of Bengal. The government, at his suggestion, introduced plants from China, and formed experimental nurseries, which were placed under his superintendence. In 1837 he was ordered to accompany Burnes' second mission to Cabul. His health having given way, he visited England in 1843. Here he was employed by the court of directors and the trustees of the British Museum in arranging an extensive collection of the Sewalik fossils and other Indian remains, and in the publication of an illustrated descriptive work entitled Fauna Antiqua Sivalensis. He returned to India early in 1848, arriving in Calcutta in February. During his residence in England he had been chosen F.R.S. in 1845, and superintendent of the botanic garden at Calcutta in June, 1847. In 1850 he was deputed to visit and report on the teak forests of Tenasserim, which were being exhausted with reckless felling. In 1855 he retired from Indian service, and returned to England by way of Palestine and Syria. At home he resumed his palæontological investigations, and took particular interest in discoveries relating to the antiquity of the human species. He died in London, 31st January, 1865.

FALCONER, WILLIAM, an English poet and writer on naval affairs, was born at Edinburgh about 1730. He went quite young to sea, in the merchant service, in which he rose to the situation of second mate, when the vessel to which he belonged was cast away, and he was thus furnished with the incidents of the Shipwreck, which was published in 1762. It was dedicated to Edward, duke of York, by whose patronage the author was appointed a midshipman in 1763. In 1769 he published a Universal Marine Dictionary. The same year he sailed for Bengal in the *Aurora* frigate, which was never heard of after she quitted the Cape of Good Hope. The subject of the Shipwreck is a voyage from Alexandria, in Egypt, for Venice, cut short by the catastrophe, which is represented as having happened near Cape Colonna, on the coast of Greece. The versification is varied and harmonious; the descriptions are drawn from nature; the incidents well told, and calculated to excite the sympathy of the reader. His other poems have little merit.

FALCONET, ÉTIENNE MAURICE, a celebrated French sculptor, was born in 1716, in humble life; and, displaying a natural taste for the fine arts, he was assisted in his studies by Lemoine. Catharine II. of Russia patronized him, and he was employed by her to execute the colossal statue of Peter the Great, erected at Petersburg, which occupied him twelve years. He wrote notes on the thirty-fourth and thirty-fifth books of Pliny's Natural History, Observations on the Statue of Marcus Aurelius, and other works relating to the arts, printed together in six vols. 8vo (Paris, 1781). Falconet died at Paris in 1791.

FALCONRY. Falconry is a very old amusement in Europe and Asia. In the middle ages it was the favourite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent, particularly in France. In an old poem on forest sports, by the chaplain Gasse de la Bigne (Roman des Déduits), cited by Curne de Sainte-Palaye in his work on chivalry, in a comparison of hunting with falconry, it is mentioned, as a particular advantage of falconry, that queens, duchesses, and countesses are allowed by their husbands to carry the falcon on their wrists, without offending propriety, and that they can enjoy all the sport of this kind of hunting, whilst, in hunting with hounds, they are only allowed to follow by the wide roads or over open fields, in order to see the dogs pass. The knight was anxious to pay his court to the ladies, on such occasions, by his attentions to the falcons. He was obliged to be careful to fly the bird at the proper moment, to follow her immediately, never to lose sight of her, to encourage her by calls, to take the prey from her, to caress her, to put on the hood, and to place her gracefully on the wrist of his mistress.

In Germany falconry was honoured as early as in the times of the Emperor Frederick II. He was so fond of this sport that he would not even give it up during the labour of war, and wrote a work on falconry, to which notes were added by his son, Manfred of Hohenstaufen (Reliqua Librorum Fred. II. de Arte venandi cum Avibus, edited by J. G. Schneider, Leipzig, 1788, two vols. 4to). In the feudal usages we also find many proofs of the esteem in which the sport was held in Germany, England, and France. In Germany there were fiefs called *Habichtslehnen* (hawk tenures), and as early as the fourteenth century some vassals were obliged to appear annually with a well-trained falcon, or hawk, and a dog trained to assist in the same sport.

In France falconry was most practised in the reign of Francis I., though this king, called the *father of hunting*, preferred the chase. The establishments for training falcons were under the direction of a grand falconer, who received an annual income of 4000 livres, and had under him fifteen noblemen and fifty falconers. He had the care of more than 300 falcons, and enjoyed the privilege of hawking through the whole kingdom at pleasure. He received a fine for every falcon which was sold, and no falconer was allowed to sell a bird without his permission. The whole establishment, which cost annually about 40,000 livres, followed the king, as did also his hunting establishment. One gentleman who was distinguished for his skill in hawking, was loaded with favours by the king, and enabled to keep sixty horses for his falconry alone. There was an old rivalry between the falconers and the hunters. When the hunting of the stag began, and the falcons mewed, the hunters drove the falconers from the yard; whilst in winter, when the stags are no longer worth hunting, the falconers retaliated on the hunters, and locked up the hounds. Falconry continued in favour until the seventeenth century; but the invention of firearms gradually superseded it.

In England falconry was also in great favour, and there is to this day a hereditary grand falconer. The Duke of St. Albans, in his office of grand falconer, presents the king with a cast of falcons on the day of his coronation. A similar service is performed by the representative of the Stanley family in the Isle of Man. Attempts have recently been made to revive that sport in this country; but it is hardly consistent with the usages of our time, particularly in England, on account of the general inclosure of the fields.

In the East, the Persians are particularly skilful in training falcons. They hawk after all kinds of birds, and even after gazelles. The falcons are taught to fasten themselves on the heads of these creatures, and to peck at their eyes, which checks them until the hounds come up. Wolves were formerly hunted in the same way in Europe. The training of a hawk is a matter requiring great pains and protracted attention. It is first kept immovable and deprived of light for seventy hours. Its legs are kept bound with jesses, or slender thongs of leather, terminated with bells. It is carefully kept from sleeping, and if it shows signs of resistance its head is plunged in water. It is also deprived of food, until, exhausted with want of rest and nourishment, it suffers itself to be hooded. When this first discipline is completed it is unhooded from time to time, and offered food,

which it seizes with avidity. When it allows itself to be hooded again without resistance it is considered tame. To make it still more dependent its appetite is stimulated artificially, by cleaning out its stomach with balls of tow attached to a thread, which it is made to swallow, and which are afterwards pulled up. This operation produces a raging hunger, by satisfying which the bird is attached to its trainer. These operations have to be frequently repeated. The bird is next taken into a garden and placed on the turf. His hood is lifted, and the falconer presents him with a morsel of meat. If he leaps on the hand of the trainer to receive it, his education is considered far advanced, and the trainer now endeavours to accustom him to the lure. This is a piece of leather to which the wings and feet of a bird are attached to make it resemble the falcon's prey. To this a piece of meat is attached. Its use is to recall the bird when it is allowed to fly into the air. The lure, in order to make the bird thoroughly accustomed to it, is made the means of conveying to it all its food. The bird is also taught to obey the voice of the falconer, without which precaution even the lure would be insufficient. When it has been taught to obey the lure in a garden it is carried to the open field, and being attached to a cord 60 or 70 feet long, it is uncovered, and shown the lure at a little distance. If it flies to it it is fed; the next day it is tried at a greater distance, and when it flies to the lure at the full distance of the cord it is considered fully tried. It is then practised in the mode of seizing its game, which is done with tame game attached to a peg. It is then made to fly at free game whose eyes have been bound, and when it is fully trained it is used for sport. It is always kept hooded during excursions, until it is wanted to fly.

FALIERI, Marino, Doge of Venice, born in 1274, commanded the troops of the republic at the siege of Zara in Dalmatia. He there gained a brilliant victory over the King of Hungary, and was afterwards ambassador to Genoa and Rome. He succeeded Andrea Dandolo, 11th October, 1354, was accused of a design to overthrow the republic and make himself sovereign of the state, and beheaded 17th April, 1355. The last scenes of his life are depicted in Byron's tragedy of Marino Falieri. A play has been written on the same subject by Casimir Delavigne.

FALISCI, a people of Etruria, said to have been originally a Macedonian colony. Their city, Falerii, is supposed to have been one of the twelve Etruscan cities. An anecdote of Plutarch respecting them has been often repeated, and forms the subject of various works of ancient art; see the article Camillus.

FALKIRK, a market town and parliamentary burgh of Scotland, in the county of Stirling, 21¼ miles west by north of Edinburgh, situated on a gentle eminence in a beautiful and fertile district, and with a station on the North British Co.'s line from Edinburgh to Glasgow. It consists of one long and somewhat irregular street, about ¾ mile in length, lying east and west, with a number of narrow streets and lanes branching off to the north and south. The only public edifices of note are the parish church, the county buildings, the offices of the Commercial and National Banks, and a handsome spire 140 feet in height. A school of arts was established in 1827. The manufactures of the town are leather, shoes, brushes, and cooper-work. There are also a brewery and the usual artisanships of a country town. In the vicinity are quarries, collieries, chemical works, brick and tile works, a saw-mill, distillery, corn-mills, and pyroligneous acid works; and near the town are vast iron-works—the Carron, Falkirk, Castle Laurie, Union, Camden, Gowanbank, &c. Falkirk is connected with the port of Grangemouth by a railway 3 miles long. The trysts of Falkirk are the greatest cattle-fairs in Scotland. They are held on a dry, sandy, level moor or heath, in the adjoining parish of Larbert, about 2 or 2½ miles north from Falkirk, on the second Tuesday of August, September, and October. At the first tryst there are generally about 4000 head of black cattle present, and about 400 horses and ponies; at each of the second and third trysts there are present about 17,000 black cattle, 20,000 sheep, and 700 horses and ponies. The larger portion of these cattle are bought up for the English market. Falkirk is of great antiquity, and is associated with many interesting and remarkable historical events. Being near the boundary that separated the Romans and Caledonians (the wall of Antoninus, now known as Graham's Dike, passed near the town) it was the scene of many sanguinary conflicts between them. In July, 1298, a battle was fought a little north of the town between the forces of Edward I. and those of Sir William Wallace, in which Sir John Graham and Sir John Stewart, commanders in the Scottish army, were slain, and both interred in the churchyard, where their grave-stones are still to be seen. About 1 mile south-west from the town a battle was fought on January 17, 1746, between the Highlanders under Prince Charles and the royal forces under General Hawley, in which the former were victorious. Falkirk unites with the burghs of Linlithgow, Lanark, Hamilton, and Airdrie, called the Falkirk district of burghs, in returning a member to the House of Commons. The Union Canal, and the Clyde and Forth Canal, pass within half a mile of the town. Pop. of parl. burgh in 1871, 9547; of entire town, 11,712.

FALKIRK, Battle of. Wallace's victory at Stirling in 1297 had broken the English superiority in Scotland. In the following year Edward led a powerful army into the country. It is said to have contained 7000 to 8000 men-at-arms and 80,000 footmen. Against this array Wallace could oppose no adequate force. He adopted the common policy of the Scots—that of wasting the country and retreating. This had nearly proved successful, as it was difficult to maintain so large an army in an enemy's country already stripped by its defenders; but two Scottish knights, it is said, sent word to Edward where Wallace's army was to be found. The English instantly prepared for an attack, and on the 22d of July the battle took place. The position of Wallace's army was on an inclined plain, with the horse, about 1000 in number, in the rear. His whole force only amounted to about a third of the English army. As frequently happened in their battles with the English, the Scotch showed great skill in formation. Their infantry was drawn up in circles, the men in the outer ring kneeling and holding their lances obliquely. The archers occupied the centre of the circles. The overwhelming superiority of the enemy's horse, however, decided the battle. The circles were broken one after the other, and nothing was left but to retreat. Wallace retired with a small body to Stirling, but the bulk of his army was broken up and destroyed. He himself seems soon after to have temporarily retired from the kingdom.

FALKLAND, an ancient royal burgh of Scotland, county of Fife, 21 miles north of Edinburgh, at the foot of the East Lomond Hill, which rises abruptly over it. The town consists principally of a single street; many of the houses thatched, and of an antique appearance. Falkland was long a favourite residence of the Scottish kings, and has in consequence obtained a prominent place in Scottish history. The only object of interest, however, which it now possesses is its ancient palace, begun, it has been supposed, by James II., and completed by James V.,

who died here in 1542. Falkland ceased to be a royal residence on the accession of James VI. to the English throne, but was visited subsequently by both Charles I. and II. There was formerly an ancient castle here also, in which David, duke of Rothesay, eldest son of Robert III., was imprisoned and starved to death by order of his uncle the Duke of Albany; but no trace of it now remains. Falkland was erected into a royal burgh by James II. in 1458. It gives the title of viscount to the English family of Carey. Pop. in 1871, 1283.

FALKLAND, Lucius Cary, Viscount, one of those rare characters who serve as proverbial instances of social excellence, was born about the year 1610. Being carried young into Ireland he received part of his education at Trinity College, Dublin, and part at St. John's College, Cambridge. His youth did not pass without irregularities, but they were suddenly closed by his marriage with a young lady of small fortune, whom he passionately loved. After passing some time abroad he returned home, and devoted himself to a life of retirement and the cultivation of polite literature. In 1633 he was appointed one of the gentlemen of the bedchamber to Charles I., but still chiefly resided at his seat at Burford, near Oxford, which he made a kind of academy of learned men, being continually surrounded by the most eminent men of the neighbouring universities. Here it was that Chillingworth composed his famous work against popery; and questions of morals, theology, and literature were discussed in a congenial circle with the utmost freedom. Lord Falkland himself was deeply read in works of controversy. In 1639 he joined the expedition against Scotland; and in 1640, his peerage being Scottish, he was chosen member of the House of Commons for Newport, in the Isle of Wight. In the first instance, like many of the most honourable characters of the day, he warmly supported Parliament. He spoke with severity against Finch and Strafford, and was so disgusted with the proceedings of Laud that he concurred in the first bill for depriving the bishops of a vote in the House of Lords. A strong attachment, however, to established forms, and some doubts of the ultimate objects of the parliamentary leaders, caused him to retract; and he afterwards strongly opposed the same measure. He still, however, kept at a distance from the court; but his high character rendered it so great an object to gain him over to the king's service, that at length he was induced to accept a seat in the council and the office of secretary of state. While in office he refused to employ spies or open suspected letters. He very decidedly embraced the party of the king when hostilities commenced, and attended him at the battle of Edgehill and the siege of Gloucester. A view, however, of the evils impending over the country, and very probably a conviction of sinister objects on both sides, broke his spirits. He would frequently sit abstracted among his friends, and sighing deeply, exclaim, 'Peace, peace!' and exhibit every sign of grief and anxiety. His closing scene almost proves a determination to die in battle, as he volunteered his services at the battle of Newbury without a command, and putting himself in the front rank of Lord Byron's regiment, was struck from his horse by a musket-shot, and was found the next day dead upon the field. Such was the fate of Lord Falkland, at the age of thirty-four; and while the universal praises which he has received are, doubtless, very much owing to the elaborate character drawn of him by his friend Clarendon, there can be no doubt of the strict integrity of his character and intentions. As a man of active talent he claims little admiration, and was evidently framed for that life of studious retirement and mental culture in which he so much delighted. One of his sayings marks his taste and character—'I pity unlearned gentlemen on a rainy day.' Lord Falkland left behind him several published speeches and pamphlets on political and theological subjects, as also a few poems.

FALKLAND ISLANDS (French, *Malouines;* Spanish, *Malvinas*), an island group belonging to Great Britain, in the South Atlantic Ocean, east of the Straits of Magellan; lat. 51° to 53° S.; lon. 57° to 62° W. They consist of two large islands, East Falkland and West Falkland, with a great number of smaller ones, about 200, surrounding them. Their area is about 7600 square miles, of which East Falkland contains 3000 and West Falkland 2000 square miles. They are hilly and boggy. There are no natives. The climate is described as very healthy, though a large proportion of the days are cloudy and tempestuous, the winds here being exceedingly frequent, violent, and changeable. The whole group is deeply indented by bays and creeks, often reducing the intervening land to a series of narrow peninsulas. There is a total want of trees, and looking from the higher ground the eye sees nothing but a vast moorland intersected by sluggish streams and pools of yellowish-brown water. Grass grows very luxuriantly, the variety called *tussock* being from 6 to 10 feet high, and the short grasses are very nutritive. The chief industry is the rearing of sheep, for which the islands are very well adapted, and cattle. Immense numbers of penguins frequent the islands, and are boiled down for their oil, which is an article of export. The sealing trade is also carried on, but the supply of seals is now almost exhausted in these seas. The exports and imports amount to about £20,000 each.

The Falkland Islands were discovered by Davis on the 14th August, 1592. They were afterwards visited (1690) by Strong, who gave them the name which they now bear. In 1710 a French vessel from St. Malo touched at them, and named them Isles Malouines. Settlements were afterwards formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them. A British settlement called Stanley was formed in East Falkland in 1853; West Falkland was settled in 1861. Stanley is now a village, and contains the residence of the governor and a jail. There is an excellent harbour here, in which considerable numbers of vessels take shelter from the dreadful storms encountered in rounding Cape Horn. Pop. 812.

FALLACY (logic) is when an argument is used as decisive of a particular issue, which in reality it does not decide. Fallacies are variously classified by different logicians. A fallacy may either exist in the substance or in the form of the argument. If it exists in the substance it does not belong to logic, as commonly understood, to expose it; but logicians differ as to what constitutes the proper distinction between form and substance. J. S. Mill in particular extends the sphere of logic in respect to the treatment of fallacies beyond what has been usually assigned to it. Among the fallacies enumerated by logicians are the *petitio principii*, or begging of the question; *ignoratio elenchi*, or mistaking the point at issue; the *argumentum ad hominem* (retort), and the *argumentum ad verecundiam* (appeal to authority), when applied to prove a position; and all violations of the syllogism.

FALLING STARS. See Meteors.

FALL OF BODIES. All bodies on the earth, by virtue of the attraction of gravitation, tend to the centre of the earth. If this tendency acts freely, the body falls towards the earth; if it is opposed by some

obstruction, pressure ensues; if the tendency is partly checked and partly efficient, pressure and descent both ensue. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. The laws according to which this motion takes place were formerly the subject of the most erroneous theories. According to the physics of Aristotle, the velocity of the fall of bodies is in proportion to their weight. Consequently any body should fall with ten times more velocity than another which is only one-tenth part as heavy. This error Galileo attacked while a student in Pisa. Soon after his appointment to a professorship, he declared himself against this and other maxims of the Peripatetic philosophy. He ascended the cupola of the lofty tower at that place, and dropped bodies of very unequal weight, which, if their specific gravity did not differ too much, were found to reach the ground at nearly the same time.

These ancient notions were eventually overturned completely on the invention of the air-pump. By means of the celebrated *guinea and feather experiment* it is shown that a guinea and a feather fall side by side in the vacuum of the air-pump, and that the sole reason why tho feather lags behind so much under ordinary circumstances, is that it exposes a surface disproportionately great to the resistance of the air. Rightly understood, this experiment proves that in the bodies that we are acquainted with *the force of gravitation is proportional to their inertia, that is to their mass*, a proposition which is often tacitly assumed or not recognized at all, but which could not be proved except by experiment. (See GRAVITY, FORCE OF.) This being understood, the laws of the fall of bodies, under the influence of the force of gravity, are very simple. The case that is generally contemplated under the name 'laws of falling bodies' is that of a body falling freely, in a straight line, and through a distance short in comparison with the distance from the centre of the earth. Such motions, therefore, as that of a pendulum swinging under gravity, or of a projectile whose motion is curvilinear, are not considered here; while the distance fallen through is taken to be so short that the force of gravity may be regarded as constant during the whole motion. Under these circumstances the following are the laws of falling bodies:—

1. When a body falls from rest it acquires velocity at the rate of about 32·2 feet per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the centre of the earth (see GRAVITY, FORCE OF): it varies but little, however, from the number just given. At the end of five seconds, therefore, the body would be found to be moving at the rate of $5 \times 32{\cdot}2$, that is 161 feet per second.

2. The space fallen through in the first second is half of 32·2, that is 16·1 feet; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16·1. Thus in three seconds a body falls $9 \times 16{\cdot}1$ feet, or 144·9 feet. The following very convenient rule may be given, if we take, instead of 16·1, the number 16 as a sufficiently close approximation:—the number of feet that a body falls in any given time is equal to the square of the number of quarter seconds. Thus in the case above, 3 seconds, the number of quarter seconds is 12, and the square of 12, or 144, is the number of feet the body falls in the time.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32·2. Thus if a body falls 9 feet, the square of the velocity acquired is $2 \times 32 \times 9$, or 576 feet per second, 32 being used instead of 32·2: and taking the square root of 576, we find that a velocity of 24 feet is acquired in a fall of 9 feet.

4. When a body is projected vertically upward with a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32·2: and it rises to a height found by dividing the square of that number by $2 \times 32{\cdot}2$, or 64·4.

FALL OF MAN, a commonly received doctrine of Christianity, founded upon the historical narrative contained in the third chapter of the book of Genesis, together with the allusions to the same matter in other parts of Scripture. The history of the fall, as given in Genesis, contains the following particulars:—God having placed our first parents, Adam and Eve, in the garden of Eden, and forbidden them under pain of death to eat of the fruit of one of the trees of it, called the tree of the knowledge of good and evil, Eve, tempted by the serpent, first ate of the fruit herself, and afterwards gave of it to her husband, who followed her example. Both were now driven out of Eden. Punitive sentences were passed upon each of them, and upon the serpent, which is alluded to by St. Paul as representing the devil. In the subsequent narrative the consequences of the fall significantly appear. The first man born of the original pair is a murderer, and his descendants grow in wickedness until a flood is sent to carry them away.

As might be expected, this most suggestive narrative has given rise to inexhaustible controversy. The opinions on the fall may be divided into three classes: those which reject the narrative altogether; those which accept it as a mythical or allegorical account of the origin of evil; those which regard it as in the main historical. With regard to the first class, as we do not purpose to enter here on a defence of the authority of Scripture, nothing more need be said of them. Those holding the second class of opinions naturally differ nearly as much among themselves as they do with the holders of the other opinions. It may be observed of them generally, that when they extend beyond allegorizing some particular point or circumstance in the narration, they receive little countenance from the sacred narrative itself. As a mere matter of literary criticism, the uninterrupted flow of the narrative down to times and events evidently historical, together with the uniformity and sobriety of its style, leave little ground for the supposition that the writer himself supposed he was dealing in allegory.

The historical view of the fall, besides the theoretical controversies to which it gives rise as to its account of the origin of evil, encounters difficulties from two sources—the modern sciences of chronology and ethnology. In the meantime these remain difficulties only, as these sciences are by no means in a state of sufficient maturity to allow their conclusions to be absolutely applied; but we shall not here enter upon difficulties of any kind, contenting ourselves with an account of the doctrine as given by Christian theologians.

Even here the ground is not free from controversy, for we do not find that the language of creeds is always that of the most eminent theologians even of the churches acknowledging those creeds. In the former we are told of a radical change in man's nature; of his being born in a condition which renders him subject to the wrath of God; and of his being in his natural condition wholly incapable of what is good, and continually intent only on what is evil. It may here be observed as a point to which the attention of modern critics who find so much discordance between the various writers of Scripture has not been sufficiently directed, that numerous as these writers are, and various as are the times and

circumstances in which they wrote, there is a striking conformity in the views they give of the natural condition of man. These views appear to justify, and indeed have suggested, the language of creeds on this subject.

It has occurred, however, to many theologians that this seemingly accurate condensation of scriptural statements in regard to man's condition as a fallen creature was not only open to many objections from reason, but rendered a consistent interpretation of Scripture itself difficult, if not impossible. It seems, for example, impossible to reconcile the constant appeals made in Scripture to the moral nature of man with the notion that that nature is inherently and radically corrupt. It would also appear that the statements of Scripture with regard to the actual moral condition of man, strong as they are, do not absolutely require this mode of accounting for them. Without supposing any radical change of man's moral nature, or even any change of it whatsoever, it is only necessary to suppose a change in his relation to God to explain all that is said regarding him. It is supposed that man's moral nature consists of capabilities which are good or bad according as they are directed, and that God himself is the object of all its highest aspirations. The fall being supposed to consist in the alienation of man from God, it is easy to perceive that all these aspirations, being deprived of their proper objects, must apply themselves to improper ones, and become evil in their tendency; hence the sudden rise of pride, selfishness, ambition, and all evil passions. In as far also as man's nature is affected by the hereditary transmission of qualities it might become actually vitiated in its tendencies, and this, together with the accumulation of evil habits, would produce those climaxes of violence or corruption which have from time to time convulsed or disintegrated society, which have called forth the denunciations of prophets, and by their very excesses have produced a reaction, which, however, has left human nature as incompetent to guide itself as ever, and ready, after a period of repose, to progress towards another crisis. The fall, according to this view, consists in the moral inadequacy of man's nature when left to itself, and the actual evils flowing from this inadequacy.

The doctrine of the fall does not stand alone in Scripture. It is universally agreed by interpreters that in the original sentence pronounced on the transgressors there is contained the promise of a redemption, and that the whole scope of Scripture is directed to the development of this promise, and of the divine scheme of providence associated with it. In the temptation of our Lord there is an analogy with that of our first parents, which Milton has seized on as the groundwork of his two great poems, Paradise Lost and Paradise Regained.

FALLOPIAN TUBES, in anatomy, are two ducts which open by one extremity into the womb, one at either angle of the fundus, and terminate at the other end in an open trumpet-shaped mouth, which at certain times grasps the ovary and receives the ovum. They are named after Fallopius (see next article), who first recognized their functions.

FALLOPPIO, Gabbiello (usually known as Fallopius), a celebrated Italian anatomist, is said to have been born at Modena about 1523. He studied at Ferrara and at Padua, at which last place he is said to have attended the lectures of Vesalius. He became professor at Ferrara, whence, in 1548, he removed to Pisa. He continued there three years, and was then made professor of surgery, anatomy, and the materia medica at Padua, where he remained till his death in 1562. The principal work of Fallopius is his Observationes Anatomicæ (Venet. 1561, 8vo), which, as well as his other writings, has been several times reprinted. He was the first anatomist who accurately described the vessels and bones of the fœtus; and his account of the Fallopian tubes in females has perpetuated his name.

FALLOW LAND is ground that has been left uncultivated for a time, in order that it may recover itself from an exhausted state. The term fallow, derived from the Anglo-Saxon *fealewe*, seems to indicate the colour of bare or ploughed land. The Romans alternated fallow with wheat crops. In modern agriculture a much longer rotation, varying from four or five to seven or eight years, is adopted, and manure is much more freely used. The specific object of fallowing is to clean the soil, which is not only exhausted but fouled by a continued succession of white or corn crops. Strictly speaking, fallow ground is left altogether without crops; but in agricultural usage strict fallow is not always adopted, and the term fallow is applied to various modes of treatment, of which at least three distinct varieties are recognized, *bare fallow*, *bastard fallow*, and *green-crop fallow*. Bare fallow is that in which the land remains completely bare for a whole year; in bastard fallow it is ploughed up and worked after the removal of a spring or summer crop, preparatory to the sowing of a root or forage crop, to occupy the ground during autumn or winter; in green-crop fallow the land is sown with a root-crop, placed in rows far enough apart to admit of the intermediate spaces being stirred, pulverized, and cleaned, during its growth by horse or hand implements. Ploughing and stirring the land, so as to admit air to decompose organic matter and form new soil, is of indispensable importance in fallowing.

FALL RIVER, a city, Bristol county, Massachusetts, United States, on an arm of Narraganset Bay, at the mouth of the Taunton River, 53 miles S.S.W. of Boston, with which and with Newport it is connected by railway. It stands on high ground, and contains several handsome streets, granite, obtained from large quarries in the neighbourhood, being extensively used for building. It has extensive cotton, woollen, and calico-printing factories, iron-works, &c. Pop. in 1870, 26,766.

FALMOUTH, a seaport town and parliamentary and municipal borough of England, in the county of Cornwall, 250 miles W.S.W. of London. There is a good harbour here, defended by Pendennis Castle on the west, and the castle of St. Mawes on the east, and with a fine and spacious roadstead. The town consists principally of one street, stretching nearly a mile along the beach. Falmouth enjoyed, for more than a century, importance as being the chief British packet station. In this respect it has been, since the introduction of steam vessels, superseded by Southampton. It is still a great port of call, and has a good retail trade, roperies, breweries, and ship-building yards, but its principal trade is furnishing supplies to shipping. It has some literary and scientific institutions. Falmouth, together with Penryn, returns two members to Parliament. Pop. 5294.

FALSE, in music, an epithet applied by theorists to certain chords, called *false*, because they do not contain all the intervals appertaining to those chords in their perfect state: as a fifth, consisting of only two tonic and two semitonic degrees, is denominated a *false* fifth. Those intonations of the voice which do not truly express the intended intervals are also called *false*, as well as all ill-adjusted combinations; and those strings, pipes, and other sonorous bodies, which, from the ill disposition of their parts, cannot be accurately tuned. Certain *closes* are likewise termed *false*, in contradistinction to the full or final close.

FALSE IMPRISONMENT (English law). To constitute the injury of false imprisonment two points are necessary: the detention of the person, and the unlawfulness of such detention. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

FALSE PERSONATION (English law). All forms of false personation, for the purpose of obtaining the property of others, were formerly misdemeanours punishable by fine or imprisonment, but are now made penal by express statute. The penalties for personation are frequently heavy. Thus to personate the owner of any share, stock, or annuity, &c., is felony, and liable to penal servitude for life, or to a modified term of penal servitude or imprisonment. The false personation of voters at an election is a misdemeanour punishable with imprisonment and hard labour, for a term not exceeding two years.

FALSE PRETENCES (English law). Obtaining property by false pretences is a misdemeanour at common law, and punishable by fine or imprisonment. Some kinds of it are now by statute punishable by penal servitude, not exceeding five years.

FALSE PROPHECIES (English law), with intent to disturb the peace, are misdemeanours at common law. By 5 Elizabeth, cap. xv. a second offence is punishable with forfeiture of goods and imprisonment for life.

FALSE SIGNALS (English law). To exhibit a false signal, with a view to bring a ship into danger, is a felony punishable with transportation for life.

FALSETTO (Ital.) applies in singing to the notes above the natural compass of the voice. It is also called a head or throat voice, in contradistinction to the chest voice, which is the natural one. The falsetto voice is produced by tightening the ligaments of the glottis. It is most effective in men with deep-set voices, the register of which it frequently extends more than an octave above the pure chest voice.

FALSE VERDICT (English law). A jury cannot now be prosecuted for giving a false verdict, but the verdict may be set aside on appeal and a new trial granted.

FALSE WEIGHTS AND MEASURES. By various statutes imperial standards are provided for weights and for measures of capacity or dimension, and all contracts of sale, &c., are referred to such standards unless there is a special agreement to the contrary. Uniformity of weights and measures is evidently founded on justice, and is indispensable as a means of facilitating the despatch of business. It was required by a statute of Henry III. in 1225, and a long train of measures has since been passed to regulate it. Examiners of weights and measures were appointed by act of George III. in 1795. The use of weights and measures, and the penalties for the use of false weights and measures, are now regulated by act 5 and 6 William IV. cap. lxiii. (1835), 22 and 23 Vict. cap. lvi.; and, for Ireland, by acts 23 and 24 Vict. cap. cxix. (1860), and 25 and 26 Vict. cap. lxxvi. (1862).

FALSIFYING RECORDS is punishable as an offence against public justice by 24 and 25 Vict. cap. xcviii. (1861), for the consolidation of penal laws.

FALSTER, an island belonging to Denmark, situated at the entrance of the Baltic, south of Seeland, and between the islands of Laaland and Moen, from which it is separated only by narrow straits; it is about 60 miles in circumference, elevated, but flat, well watered and wooded, productive in grain, pulse, potatoes, and, above all, fruit, so that it is styled the *orchard of Denmark*. The principal towns are Nyekioping and Stubbekioping. Pop. with Laaland (1870), 90,706.

FALUN, or FAHLUN, a town, Sweden, capital of län (county) of same name, on a stream connecting lakes Vårp and Rum, 130 miles north-west of Stockholm. It consists chiefly of low wooden houses of somewhat antiquated appearance, has two churches, infirmary, hospital, and excellent mining school; and owes its prosperity to the copper mines which have long been successfully worked in its vicinity. Pop. 5891.

FAMA, the goddess of report or rumour. She was the youngest daughter of the Earth, who revenged herself on the gods for the destruction of her sons, the giants, by bringing forth this mischievous goddess. Loquacious Fame divulges the deeds of the gods, and spreads reports among men. She is represented with wings; with as many ears, eyes, and tongues as feathers. She is said to fly through the world in the night, and in the daytime to look down from high towers and roofs; small at first, and gradually increasing in size in her progress, &c.—These are the fictions of Virgil and Ovid.

FAMA CLAMOSA, in the ecclesiastical law of Scotland, is a public report imputing immoral conduct to a clergyman, licentiate, or office-bearer of the church. If a fama clamosa arise against a clergyman a church court is only bound to take notice of it, if no direct accusation is made, when it becomes so notorious that it cannot be overlooked without apparent negligence or laxity of discipline. When this is the case the presbytery, or court of first instance, first inquires into the occasion of the fama, and if it appears that there is sufficient ground for instituting a process (libel), and no particular party comes forward to do so, they libel him themselves.

FAMAGOSTA (ancient *Arsinoë*), a ruined seaport of Cyprus, on the east coast, built on a rock. It is about 2 miles in circumference, and was once strongly fortified, but is now in decay. It was a place of considerable importance during the Crusades. After being taken by the Crusaders, under Richard I., it belonged successively to the Cyprian Kingdom of Guy de Lusignan, to the Genoese, and to the Venetians. It was captured by the Turks after a protracted siege in 1571. In 1735 it was destroyed by an earthquake.

FAMILIAR SPIRITS, demons or evil spirits supposed to be continually within call, and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring, or the like; sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in all ages and countries, under various forms. In eastern stories nothing is more common than the mention of magic gems, rings, &c., to which are attached genii, sometimes good, sometimes bad. The fawn of Sertorius is a well-known instance in Roman history. But in modern Christian Europe the notion of familiar has been restricted to evil spirits. Cornelius Agrippa is said, by Jovius, to have been always accompanied by a devil in the shape of a black dog, which, on the death of his master, plunged into the Saône, and was never seen afterwards. Paracelsus was believed to carry about a familiar in the hilt of his sword. The story of the witch of Endor, contained in the 28th chapter of 1 Samuel, has been the source of a wide-spread belief in the communion of certain persons, particularly women of peculiar habits, with familiar spirits in our own country down to modern times. Allusion is made to this belief in numerous plays of Shakspeare,

and until the reign of George II. women suspected of intercourse with familiars were liable to be prosecuted for witchcraft.

FAMILY COMPACT, the name given to a compact organized by the Duke de Choiseul, first minister of Louis XV., between the various members of the Bourbon family, then sovereigns of France, Spain, the Two Sicilies, Parma, and Piacenza, mutually to guarantee each other's possessions. It was signed 15th August, 1761. It entailed on Spain a war with England, then at war with France.

FANARIOTS, or PHANARIOTS, the inhabitants of the Greek quarter, or Phanar, in Constantinople, particularly the noble Greek families resident there since the times of the Byzantine emperors. The dragoman or interpreter of the Porte used to be taken from their number. From 1731 to 1822 the Porte also chose from their number the hospodars of Moldavia and Walachia. Till 1669 the office of dragoman had been filled by Jews and renegades. In that year Mohammed IV. for the first time employed a Greek, Panayotoki, as grand interpreter. The power of the influential Fanariots soon increased so much that, after the cruel death of the last native hospodar of Walachia, Bassaraba Brancareo, in 1731, a Greek, Mavrocordatos, was appointed to succeed him. They have now no political influence.

FANATICISM is the term applied more particularly to the extravagance manifested in religious matters, by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiastic views, but also of inordinate and not unfrequently persecuting measures. By an extension of the term it is also sometimes applied to other forms of extravagance, which in their outward manifestation are accompanied with impetuosity and violence. Thus we speak of political fanaticism, which, in affairs of state, displays itself in a violent and intolerant partisanship. Not unfrequently both kinds of fanaticism are found combined, and to this combination most of the religious wars which have desolated kingdoms are to be ascribed.

FANCY, sometimes, in old writers, FANTASY or PHANTASY (Greek and Latin, *phantasia*, from *phantazo*, to make visible; Italian, *fantasia;* French, *fantaisie;* German, *phantasie*). This word, so widely received, has, especially in its shorter and more facile form, acquired a special currency, and a peculiarly indigenous flavour in English. In its general acceptation it refers both to the forms of the imagination, and to the mental faculty which produces them. Fancy is not, however, in this double sense, quite co-extensive with imagination. It is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them. Sometimes it approaches to the grotesque, and is closely allied to humour. At other times it is more delicate, and represents the lighter and more aërial forms of imagination. Sometimes, again, it is nearly synonymous with imagination in its full extent. This vagueness and flexibility of meaning has made the word a favourite one with poets and imaginative writers, and there is hardly any word for the use of which more abundant quotations might be found in this class of authors. A very few instances will suffice to show the latitude with which it is used.

'Shakspeare, fancy's sweetest child.'—Milton.

'Love is by fancy led about,
From hope to fear, from joy to doubt.'—Granville.

'Tell me, where is fancy[1] bred,
Or in the heart or in the head?'—Shakspeare, Mer. of Venice.

'Desert, not fancy, once a woman led.'—Dryden.

See IMAGINATION.

[1] That is, a fancy or liking for an individual—love.

FANDANGO, EL, an old Spanish dance, which originated most probably in Andalusia. Foreigners are very much astonished, and not less offended, when they see this dance for the first time; however, few fail to become reconciled to it. It proceeds gradually from a slow and uniform to the most lively, but never violent motion. It is said that the court of Rome, scandalized that a country renowned for its faith should not have long before proscribed such a profane dance, resolved to pronounce a formal condemnation of it. A commission was appointed to examine into the matter, and the fandango was prosecuted *in forma*. The sentence was about to be pronounced, when one of the judges observed that a criminal could not be condemned without being heard. A couple of Spaniards were brought before the assembly, and, at the sound of proper instruments, displayed all the graces of the fandango. The judges were so much excited that their severity abandoned them; their austere countenances began to relax; they rose, and their arms and legs found their former suppleness. The hall of the grave fathers was thus changed into a dancing-room, and the fandango was acquitted. The fandango is seldom danced but at the theatre, and in the parties of the lower classes. It is danced by two persons only, who never touch so much as each other's hands; their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

FANEUIL HALL. See BOSTON.

FANFARE (French), a short, lively, loud, and warlike piece of music, composed for trumpets and kettle-drums. Also small, lively pieces performed on hunting-horns, in the chase. From its first meaning is derived *fanfaron*, a boaster, and *fanfaronade*, boasting.

FANO (ancient *Fanum Fortunæ*), a seaport town, Italy, in a rich and fertile plain on the Adriatic, province of Pesaro e Urbino, 29 miles north-west of Ancona. It is a handsome, well-built town, surrounded by walls, which it owes to the Emperor Augustus, and containing among its gates a triumphal arch of white marble erected to his honour. Its trade, which was once important, has greatly declined, partly in consequence of the sanding up of its harbour. Pop. 6901.

FAN-PALM, the talipot tree, or great fan-palm (*Corypha umbraculifera*), is a native of Ceylon, Malabar, and the East Indies. It attains the height of 60 or 70 feet, with a straight, cylindrical trunk, crowned at the summit by the leaves, and is one of the most magnificent of the whole tribe of palms. The leaves are of great size, the petiole being 7 feet long, the oval blade 6 feet long and 13 feet broad, and the segments of the leaf from ninety-five to a hundred in number. When this palm has reached the age of thirty-five or forty years it flowers, a long, conical, scaly spadix rising to the height of 30 feet from the midst of the crown of leaves, and separating into simple alternate branches, which, at the base, extend laterally sometimes 20 feet, the whole covered with whitish flowers, and presenting a most beautiful appearance. The fruit is very abundant, globose, about 1½ inch in diameter, and requires fourteen months to ripen, after which the tree soon perishes, flowering but once in the whole course of its existence. The inhabitants of those countries where it grows make use of the leaves for umbrellas, tents, or for covering their houses; and the Malabar books are formed of the same material, on which lasting characters are traced by means of a sharp-pointed iron style, which penetrates the superior epidermis. The pith, after being pounded, is made into a kind of

bread. Several other palms, whose leaves, when they first appear, are folded together like a fan, and afterwards spread open in a similar manner, are called *fan-palms*, particularly the *Chamærops humilis*, a species destitute of a stem, and inhabiting the south of Europe and north of Africa.

FANS. The Greeks were well acquainted with fans as an article of luxury. From a passage in the Orestes of Euripides it appears that the Grecian fans were introduced from the East, that they were of a circular form, and were mounted plumes of feathers. Dionysius of Halicarnassus describes the courtiers of Aristodemus at Cumæ as attended by females bearing parasols and fans (*skiadia kai ripidas*). Plautus mentions *flabelliferæ* as forming part of a Roman fine lady's retinue, and Suetonius describes Augustus as lying, during the heat of summer, in the shade, and fanned by an attendant (*ventilante aliquo*). In the middle ages fans were used in the churches, sometimes of great size, and richly decorated, to chase away the flies from the holy elements of the eucharist. They are said to have been introduced into England from Italy in the reign of Henry VIII.; and in the reign of Elizabeth they were framed of very costly materials, the body of ostrich feathers, the handle of gold, silver, or ivory, of curious workmanship. Fans in the form of machines are used in agriculture for winnowing corn; in metallurgy and other branches of manufacture for ventilating and stimulating the combustion of fires; for the ventilation of mines; and for various other manufacturing purposes.

FANSHAW, Sir Richard, an eminent diplomatist, poet, and translator, born at Ware, Hertfordshire, in 1608. Having studied at Cambridge he made the grand tour, and on his return entered himself of the Inner Temple. He was despatched in 1635 by Charles I. in the capacity of secretary to the embassy at Madrid. On the breaking out of the civil wars in 1641 he engaged actively in the royal cause, and was appointed secretary at war to the Prince of Wales in 1644, and treasurer to the navy under Prince Rupert in 1648. He was made a baronet in 1650, and sent on an embassy to Spain, and afterwards appointed secretary of state for Scotland. He was taken prisoner at the battle of Worcester in 1651. A severe illness shortened the term of his imprisonment, and he was permitted to go at large on bail. On the death of Cromwell he passed over the Channel in 1659 to the king at Breda, by whom he was made his Latin secretary and knighted. In 1661 and 1662–63 he was employed on two several missions to the court of Lisbon, in the former of which he negotiated the marriage of Charles II. with Princess Catherine, and on his return in 1663 he was advanced to a seat in the privy-council. In 1664 he was sent ambassador to Madrid, and negotiated a peace between England, Spain, and Portugal. Falling suddenly ill of a fever he died at Madrid, June 16, 1666. His poetical abilities were above mediocrity, as is evinced by his translations of the Lusiad of Camoens, the Pastor Fido of Guarini, the Odes of Horace, and the fourth book of the Æneid into English verse, and Fletcher's Faithful Shepherdess into Latin. Among his posthumous writings, printed in 1701, is his correspondence during his embassies to the courts of Lisbon and Madrid, and some occasional poems, with a life of the author prefixed.

FANTASIA (Italian), in music, the name given to a species of composition, supposed to be struck off in the heat of imagination, and in which the composer is allowed to give free range to his ideas, and to disregard those restrictions by which other productions are confined. Some writers limit the application of this term to certain extemporaneous flights of fancy, and say that the moment they are written or repeated they cease to be *fantasias*. This, they add, forms the only distinction between the *fantasia* and the *capricio*. The *capricio*, though wild, is the result of premeditation, committed to paper, and becomes permanent; but the *fantasia* is an impromptu, transitive and evanescent, exists but while it is being executed, and when finished is no more.

FANTEE, a country of Africa, on the Gold Coast, which extends about 90 miles along the shore of the Atlantic, and 70 inland; lat. 5° 30′ N.; lon. 1° W. The inhabitants, called *Fantees*, were the most numerous and powerful people situated immediately on the Gold Coast; but their power has been almost entirely broken since 1811 by repeated invasions of the Ashantees. The soil is fertile, producing fruits, maize, and palm-wine. A Fantee is known from other Africans by small scarifications on the upper part of the cheek-bones and the back of the neck. Their government is aristocratic. Their chief is a supreme judge or governor, attended by a council of old men. Each town has a chief. The capital is of the same name, and is situated about 12 miles up the country. The country of the Fantees is still represented as being populous and prosperous, owing to the protection afforded by the British settlements, and particularly by Cape Coast Castle. They have recently (1873) been again attacked by the Ashantees, who have also threatened the British settlements, and compelled the government of Great Britain to send out an expedition under Sir Garnet Wolseley to suppress them.

FARADAY, Michael, one of the greatest of English chemists and natural philosophers, was born in humble circumstances at Newington Butts, near London, on the 22d September, 1791. Early in life he was apprenticed to a bookbinder in London, and in this position he manifested his strong taste for study by eagerly reading the books which he bound. At the same time he occupied himself in his leisure hours with the construction of electrical and other machines, with scientific experiments, and other similar pursuits. By this means he attracted the notice of a friend of his master's, who took him with him to Sir Humphry Davy's lectures, which Faraday continued regularly to attend. He now became more and more anxious to quit trade, which was in every way distasteful to him, and to devote himself to the service of science in however mean a capacity. With this end he sent his notes of the lectures he had heard, which he had taken with great care, to Sir Humphry Davy, informing him at the same time of his present position and his desire to change it for a more congenial one. Struck by the great ability which these notes displayed, Davy promised to do what he could to carry out his views, and a few weeks after, early in 1813, he appointed him his assistant at the Royal Institution. The period from October, 1813, to April, 1815, was spent by Faraday in travelling over the Continent as scientific assistant and secretary to Sir Humphry, and after his return he remained in close application to his favourite studies, and in uninterrupted connection with the scientific institution he had first joined. In 1829 he was appointed chemical lecturer at the Royal Military Academy at Woolwich —an office which he retained till 1842; and in 1833, when the chair of chemistry at the Royal Institution was founded, he was appointed the first professor. It was while he held this office that the most of his great electrical discoveries were made, and communicated to the Philosophical Transactions. Already in 1821 he had made the important observation referring to the connection between electricity and magnetism, which was the first of a series of discoveries on that subject that in 1823 procured him the honour of being elected corresponding member of the French Academy of Sciences, and in 1825 of being admitted fellow of the

Royal Society. His first communication to the Philosophical Transactions was made in 1831. It was followed up by a large number of others, extending over a great many years; and these were afterwards published separately in three volumes, the first in 1839, the second in 1844, and the third in 1855. In 1832 he received the honorary degree of D.C.L. from Oxford; in 1842 he was elected honorary member of the Academy at Berlin; in 1844 he was made one of the eight foreign associates of the Academy of Sciences of Paris; and various other honours, too numerous to mention, were bestowed on him, both at home and abroad. In 1835 he received a pension of £300 a year from Lord Melbourne, and in 1858 Queen Victoria granted him a residence at Hampton Court, where he lived during the summer in the remaining years of his life, and where he died, August 25, 1867.

The following may be mentioned as a few of his most important discoveries:—induced electricity; the identity of electricity from different sources; the relation of gravity to electricity, and of the electric and magnetic forces; diamagnetism and the magnetic condition of all matter; while the electric telegraph and the aniline dyes are justly regarded as indirect results of his philosophical experiments. As an experimentalist Faraday was considered the very first of his time; and he was as remarkable for the wonderful care and delicacy with which he performed his experiments as for the thorough knowledge of his subject, and the far-reaching thought which he displayed in conceiving them. He was equally distinguished as a lecturer, and as such captivated the young and the old. In his lectures on the physical forces, addressed to the young, he showed with what skill he could make some of his profoundest researches perspicuous and attractive even to those who had had no scientific training. His lectures have been published at different times. First appeared his Lectures on Light and Ventilation (London, 1843); then his Lectures on the Non-metallic Elements (London, 1853); and Lectures on Various Forces of Matter (London, 1862).

FARCE (from the French), a dramatic piece of low comic character. It is grotesque and extravagant rather than artistically humorous. Many nations have a standing character who regularly appears in their farces, and is always, therefore, very characteristic; the Spaniards have the *gracioso, gallego;* the Italians the *arlecchino, scaramuccio,* &c.; the German their *Hanswurst, Kasperle,* &c. The word is derived from the Italian *farsa,* this from the Latin *farsum,* stuffed, signifying therefore a mixture of different things. Adelung says that in the middle ages *farce* signified in German certain songs, which were sung between the prayers on occasions of religious worship; so that *farce* in respect to comedy would originally signify an interlude (*intermezzo*). According to the Abbé Paolo Bernardi, a Provençal, it is derived from *farsum,* a Provençal dish.

FARCY, a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. It is supposed to be a disease of the absorbents of the skin, and its first indication is generally the appearance of little tumours called farcy buds on the face, neck, or inside of the thigh. By order of council animals affected with farcy must be destroyed.

FAREHAM, a market town, England, Hampshire, at the head of a short arm of the harbour, and nearly 5 miles N.W. of the town of Portsmouth. It has a wet-dock and building-yards, extensive potteries and brickworks; and a considerable trade in corn, coal, and timber. Pop. in 1871, 7023.

FAREL, GUILLAUME, one of the earliest and most active of the Swiss reformers, was born in 1489, in Dauphiny, and at an early period was led by his intercourse with the Waldenses to adopt similar views. After preaching the gospel with ardent zeal in parts of the canton of Bern and Biel, he planted the reformed doctrines in Neufchâtel in 1530. Geneva, however, became the principal scene of his labours. Here, in the religious conferences of 1534 and 1535, he defended the gospel so successfully that the reformed parishes not only obtained permission to hold public religious service, but the council formally embraced the Reformation. He rendered still more important service to Geneva, by laying hold of Calvin as he was travelling through the city, and persuading him to take up his residence in it. In concert with Calvin he took an active part in 1536 at the disputation in Lausanne, when the Reformation was embraced. In consequence of a quarrel, arising out of an attempt to enforce a stricter moral discipline than the Genevese had been accustomed to under the rule of the house of Savoy, he left Geneva in 1538, and took up his residence in Neufchâtel, where he died in 1565. He was one of the most esteemed friends of Calvin, and remained in the closest intimacy with him to the last. His life has been written by Kirchhofer, two vols., Zürich, 1831–33.

FARIA Y SOUSA, MANUEL, historian and lyric poet, born 1590, at Suto, in Portugal, of an ancient and illustrious family. In his ninth year he was sent to the University at Braga, where he made great progress in the languages and in philosophy. In his fourteenth year he entered the service of the Bishop of Oporto, and under his direction made further improvement in the sciences. A passion for a beautiful girl first awakened his poetical genius. He celebrated her under the name of Albania in his sonnets, married her in 1613, and went to Madrid. But he did not succeed there, and returned to Portugal. He also visited Rome, and gained the notice of Urban VIII. and the learned men at his court by his extensive knowledge. He returned again to Madrid, and devoted himself entirely to literature, with such ardour as to hasten his end. He died about 1649. Among his writings are—Discursos morales y politicos (Madrid, 1623–26, two vols.); Epitome de las Historias Portuguesas (1628); Comentarios sobre la Lusiada (Madrid, 1639, two vols. fol.); and afterwards El Asia, El Europa, El Africa, and El America Portuguesa, each a separate work, the last never printed. We have also a collection of his poems called Fountain of Aganippe (Fuente de Aganipe, Rimas varias, 1644–46). His style was pure and strong, and his descriptions full of vigour.

FARINA is the meal or flour of wheat or other starchy grains, hence called farinaceous.

FARINELLI, one of the greatest singers of the last century, was born at Naples in 1705. His true name was Carlo Broschi. He received his first instructions in music from his father, who, to develop his vocal powers, subjected him to the operation of castration, and he afterwards studied under Porpora, whom he accompanied on several journeys. At the age of seventeen years he went to Rome, and displayed his clear and full-toned voice in a contest with a celebrated performer on the trumpet, whom he overcame by his strength and perseverance. He visited Vienna, Paris, and London with the greatest success, and was greatly improved by the advice of the Emperor Charles VI., a judicious critic. On visiting Spain, where he intended only a brief sojourn, he found King Philip V. plunged in a profound melancholy. He succeeded in rousing him from it by the powers of his voice, and became his prime favourite and political adviser. But the penalty of his advancement, as he tells in his correspondence with Burney, was that for ten years he had to sing

every night to his royal master the same four airs. He continued in favour with Philip's successors Ferdinand VI. and Charles III., and continued in Spain altogether from 1737 to 1761. On his return to Italy he found himself almost forgotten, but continued to exercise a splendid hospitality in his country house, near Bologna. He entirely gave up singing, but played on, and composed for several instruments. Several high authorities give the most extraordinary and seemingly extravagant encomiums on his vocal powers. His voice reached the soprano range, having six or seven full clear notes above the common register of male voices, and Burney says it had every excellence of every singer united. He died in 1782, having collected the most extensive musical library of his day.

FARM and FARM-BUILDINGS. The size of farms and their tenure differs very much in different countries. On the Continent, where peasant proprietaries, metayers, and mixed tenures prevail, farms are generally small. In England, where the land is in the hands of a small number of proprietors, and is let out to farmers who make a trade of cultivating them, they are generally large. The short tenure of land usually prevailing in England and Ireland has given rise to many disputes about compensation for improvements effected by tenants, &c. The system in Scotland of giving a lease for nineteen years is much preferable. The buildings necessary on a farm of course depend on its size and the system of cultivation. With the farms common in this country, a farm-house or residence for the farmer, cottages for the servants, buildings for cattle, dairies, barns, &c., for the crops, are all considered essential. The size of these buildings depends a good deal on the method of management, the number of cattle reared on the premises, and the amount of produce kept for feeding them; the distance of the market, and the processes the crops undergo before being carried to it. Much greater attention is now paid to all these points than formerly, as the economical management of a farm greatly depends on them. The importance, in particular, of clean and well-aired sheds for cattle is now universally recognized. From the outcry frequently raised about the bothy system, this does not seem to be quite as well recognized in the case of the labourers, but it is to be hoped their time for improvement will come also. Covered farm-yards, containing all the offices under one roof, are becoming common, and offer many conveniences besides economy in erection.

FARMERS-GENERAL (French, *Fermiers généraux*), private contractors, to whom the French government let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco, customs, &c. These contractors made enormous profits on the farming of the public revenues, the indignation excited by which was one of the stimulating causes of the French revolution. The system of farming the revenues goes back as far as the thirteenth century. Philippe the Bel frequently contracted with Jews and Lombards for the collection of the taxes. A revenue collected in this way not only imposed a much heavier burden on the people, but the merciless rigour of irresponsible and uncontrolled exactors subjected them to hardships and indignities to which they could not submit without degradation; summary executions, violence, and imprisonment, left a train of injuries to rankle in the minds of a sensitive people, sufficient to overturn the firmest government that ever existed. During the prevalence of this abuse, however, the farmers-general became wealthy, and powerful enough to exercise a great influence in the state, and thus their victims had small hope of redress except in revolution, and frequent popular revolts were the consequence. In the reign of Louis XIII. 120 of these mercenary oppressors have been reckoned to exist in France, and as their privileges were commonly sublet, with, of course, a new set of profits to the sub-agents, an army of locusts could hardly have been more destructive to the agriculture of Egypt than they were to the industry of France. Henry IV.'s great minister Sully cancelled many of their contracts, but the system was too deep-rooted to be got rid of by a single-handed financier. In 1720 Louis XV. ceded first to forty, and afterwards to sixty farmers-general, called the general farm, the collection of the taxes on consumption for 55,000,000 livres per annum; in 1726 80,000,000 was paid for the renewal of the privilege; in 1759, after the taxes had been reduced one-half, they still brought 72,000,000; in 1774, 135,000,000, besides large bribes, were paid for them. The last sale, in 1789, brought 180,000,000. In 1790 the farm was suppressed by the constituent assembly. Many of the farmers-general, among whom was the celebrated chemist Lavoisier, fell victims to the popular indignation, and perished on the scaffold.

FARMING. See AGRICULTURE.

FARNE, FEARNE, or FARNE, a group of islets, England, in the German Ocean, off the north coast of Northumberland, 2 miles E. by S. of Bamborough Castle, and separated from the mainland by a channel of about 1¼ mile. They have been the scene of several disastrous shipwrecks, one of which, that of the *Forfarshire* steamer, in 1838, occasioned the signal display of heroism by Grace Darling, daughter of the keeper of the outer Farne light. Another steamer, the *Pegasus*, from Leith to Hull, was lost here in 1843, when sixty individuals perished. Pop. in 1871, 18.

FARNESE, an illustrious family of Italy, whose descent may be traced from about the middle of the thirteenth century, at which time it had possession of the castle of Farneto, in Orvieto, and gave to the church and the Republic of Florence many eminent generals, among whom was PIETRO FARNESE, to whom the Florentines were indebted for an important victory over the people of Pisa (1363).—PIETRO LUIGI FARNESE, son of Pope Paul III., received from his father in 1545 the duchy of Parma and Piacenza, which Julius II. had conquered from Milan. Pietro proceeded to Piacenza, where he built a citadel, and commenced his tyrannical reign by imposing many burdens on the nobility, and depriving them of their former privileges. His tyranny becoming insupportable, the chief nobles conspired against him, and assassinated him, 10th September, 1547.

OTTAVIO FARNESE, the son and successor of Pietro, was then at Perugia with Paul III. Parma declared itself in favour of Ottavio, who took possession of it with the Papal troops, but found himself, singly, too weak to attempt the capture of Piacenza. Julius III., the successor of his grandfather, out of gratitude to the family of Farnese, restored to him the duchy of Parma in 1550, and appointed him gonfalonier of the church. His wife, Margaret, natural daughter of the Emperor Charles V., ruled for some time over the Low Countries, and administered the government with great moderation, till superseded by the Duke of Alva in 1567. Ottavio died in 1586, after enjoying thirty years of uninterrupted peace, which he had employed in correcting the disorders of the preceding governments, and promoting the happiness of his subjects.

ALESSANDRO FARNESE, elder son of Ottavio, general of Philip II. in Flanders, and third duke of Parma and Piacenza, born about 1552, succeeded him. He was married in 1565 to Mary, niece of John, king of Portugal. He served his first campaign under Don John of Austria, and distinguished himself in

the battle of Lepanto in 1571. In 1577 Philip II. called him from Abruzzo, where he resided with his mother, in order to lead back the Spanish troops, which Don John had been obliged to dismiss from Flanders; and Don John dying that year, Alessandro was made governor. He recovered Maestricht and several other cities, and succeeded in reconciling the Catholic part of the insurgents to the Spanish government. The Protestants, however, formed the union of Utrecht (1579), and called in the Duke of Anjou, a brother of Henry III. of France, to defend them. He appeared at the head of an army of 25,000 men; but Alessandro was constantly successful. Fortunately for the Dutch, who would hardly have been able long to resist a general so bold, skilful, and enterprising, a civil war broke out in France. Alessandro entered France, and compelled Henry IV. to raise the siege of Paris (1590). During his absence Maurice of Nassau had obtained many successes in the Netherlands, yet, with a mutinous and unpaid army, Alessandro kept in check both Maurice and Henry IV., and forced the latter in 1592 to raise the siege of Rouen. On his return from that expedition he received a wound before Caudebec, and died at Arras in 1592.

RANUZIO I., his eldest son, succeeded him as duke. He inherited none of the heroic qualities of his father, but was gloomy, severe, suspicious, and avaricious. Observing the discontent of the nobles with his administration, he accused them of having entered into a conspiracy against him, and, after having subjected the chiefs to a secret trial, beheaded them, and confiscated their estates (May 19, 1612). This unprecedented cruelty roused the indignation of many of the Italian princes, and the death of Vincenzo Gonzaga, Duke of Mantua, alone prevented the breaking out of a war. He imprisoned his natural son Ottavio, who had acquired the favour of the nation, and left him to perish in cruel confinement. Ranuzio died in 1622. Notwithstanding the ferocity of his character he discovered a taste for letters and the arts.

FARNESE PALACE and FARNESINA, at Rome, a palace built by Paul III. in the form of a quadrangle, and finished by Michael Angelo, is one of the finest palaces in Rome. La Farnesina is the name of another elegant palace in the Trastevere. It is celebrated for the frescoes of Raffael, Peruzzi, Sesbatian del Piombo, and other works of great masters.

FARNHAM, a market town, England, county of Surrey, on the Wye, 35 miles S.W. of London. It is a well-built place, of thriving and attractive appearance, consisting of four principal streets which meet in a central market-place, and containing a handsome and spacious Gothic parish church. North of the town is a residence of the bishops of Winchester, originally built by Henry de Blois, brother of King Stephen, and about two miles south are the extensive ruins of the abbey of Waverley. The staple trade is in hops. William Cobbett was born here. Pop. in 1871, 4461.

FARO, a seaport on the south coast of Portugal, in the province of Algarve, at the mouth of the Valformosa, 62 miles S.E. of Cape St. Vincent. It is surrounded by Moorish walls and defended by a small citadel, is well built, and has a cathedral, a college, a custom-house, several hospitals, a harbour, which is not very commodious, though the roadstead is good; and a considerable trade, chiefly in oranges, dried fruits, shumac, cork, fish, and articles made of esparto. Pop. 8361.

FARO, or PHARO, a game of hazard at cards played chiefly in gambling establishments. See HOYLE'S GAMES.

FARO, a promontory forming the north-east point of Sicily at the entrance to the Strait of Messina. The point is strongly fortified, and on it there is a lighthouse 200 years old, built on the ruins of an ancient tower.

FAROE (or FAROER) ISLANDS, a group of islands in the Northern Ocean, lying between Iceland and Shetland, and between 61° 15′ and 62° 20′ N. latitude. They belong to Denmark, and consist of twenty-two islands, of which seventeen are inhabited. The islands generally present steep and lofty precipices to the sea; the surface rises towards the interior and terminates in peaks, the culminating point being 2800 feet high. The climate is milder than the latitude might indicate, but the weather is very variable. Sheep and horses can winter in the open air. The soil is generally thin; barley is the only cereal that comes to maturity; turnips and potatoes thrive well. There is no wood, but plenty of excellent turf, and coal also. The wealth of the inhabitants is chiefly derived from fishing and the feeding of sheep. The feathers of sea-fowl form an important article of trade. Some horses and cattle are kept; the former are small, but strong and hardy. Thorshavn, in Stromöe, the largest island, is the seat of government. Pop. in 1870, 9992.

FARQUHAR, GEORGE, a comic writer of eminence, was born at Londonderry, in Ireland, in 1678. In 1694 he was sent to Trinity College, Dublin, whence, however, he either eloped or was expelled, in consequence of irregular conduct. His partiality for the drama induced him to make his appearance on the stage at Dublin; but he displayed little ability as an actor, and he soon relinquished the profession he had so hastily chosen. About 1696 he accompanied his friend Wilks the player to London, where he commenced writing for the stage. His first production was Love in a Bottle, performed at Drury Lane Theatre with great success in 1698. About this time he attracted the favour of Lord Orrery, who procured him a lieutenancy in his own regiment. In 1700 he added to his reputation by his comedy of The Constant Couple, or the Trip to the Jubilee, in which, under the character of Sir Harry Wildair, he exhibited a lively picture of the foppish fine gentleman of the end of the seventeenth century. In 1701 appeared Sir Harry Wildair, a sequel to the former comedy; and the following year he published a volume of Miscellanies, consisting of poems, letters, essays, &c. The Inconstant, or the Way to Win Him, was the next effort of his pen; and it is amongst those which have kept possession of the stage. It has great merit, but much of it is borrowed from the Wildgoose Chase of Beaumont and Fletcher. About 1703 he married a lady who, having fallen in love with him, had represented herself as the heiress of a large fortune, and Farquhar is said to have pardoned the deception, and treated her with kindness. In 1706 appeared The Recruiting Officer, one of his most popular plays; and this was succeeded by The Beaux' Stratagem, which is reckoned his masterpiece, though finished within the short space of six weeks, while labouring under serious indisposition. He died in 1707. It is no mean testimony of the dramatic talents of Farquhar that three of his plays are still favourites with the public. His wit is genuine and spontaneous, and his characters are admirably supported, and drawn from nature. His plots excel in the arrangement of incidents, and in unity of action. The libertinism of language and sentiment which his works exhibit cannot be defended; but it was the vice of the age rather than the writer, who was much less culpable in this respect than Dryden or Wycherley.

FARRAGUT, DAVID GLASCOE, admiral of the United States, was born near Knoxville, Tennessee,

in 1801. He entered the navy as midshipman at the age of eleven. In 1821 he was promoted to a lieutenancy, and ordered to the West India station. He was actively engaged in his profession up till 1851, when he was appointed assistant inspector of ordnance. In 1855 he received a commission as captain. In 1861 he was appointed to command the expedition against New Orleans, undertaken on the formation of the Confederacy, and sailed in January of the following year. New Orleans surrendered to the combined attack of the land and naval forces on 28th April, and Farragut proceeded to Vicksburg, which he attacked unsuccessfully. In consequence of his success at New Orleans he was promoted to the rank of vice-admiral, and placed in command of the blockading squadron of the Gulf of Mexico. During the autumn he took several places on the coast, including Galveston. In 1863 he co-operated with Grant and Banks in the capture of Fort Hudson and Vicksburg. In August, 1864, he attacked the Confederate fleet in the bay of Mobile, and received the surrender of Admiral Buchanan, who commanded it. After this exploit he was made admiral, a grade which had not hitherto existed in the United States navy. In 1867 he was appointed to the command of the American squadron in Europe, and visited England. He died 13th August, 1870.

FARRANT, Richard, one of the earliest English composers of music. Very little is known of his history. He was a gentleman of the chapel royal in 1564, and subsequently organist and choir-master. He is supposed to have died about 1585. According to Hullah, musical performers of a high class were at this period well distributed over Europe, but were almost entirely dependent on Italy for their music. Farrant is one of those on behalf of whom he claims the existence of an independent English school of music. His music is ecclesiastical, and is distinguished by purity, simplicity, tenderness, and elevation of tone. The anthems Call to Remembrance, Lord, for Thy Tender Mercies' sake, and Hide not Thou Thy Face, are well known and highly esteemed by lovers of good music.

FARRINGDON, or Great Farringdon, a market town, England, county of Berks, on a gentle height 15 miles south-west of Oxford, with a handsome Gothic parish church, several Dissenting chapels, and a trade in hops and bacon, corn, malt, sheep, and cattle. Pop. in 1871, 3525.

FARS, or Farsistan (ancient *Persis*), a province in the south-west of Persia, about 300 miles long by 250 miles broad, and bounded N. by Irak Ajemi and Khorassan, E. by Kirman, S.E. by Laristan, S. and S.W. by the Persian Gulf, and W. by Khuzistan. It is mountainous in the north-west and south-east, flat in the north and north-east, and hilly towards the centre. Notwithstanding large tracts of barren sand, it has several well-cultivated districts, and extensive vales covered with wood and verdure. Its chief rivers are the Bandamir or Araxes, and the Nabon; and it has several salt lakes, of which the largest is that of Bakhtegan. Agriculture, though less prosperous than in former times, is still better attended to than in most parts of Persia. The most important products are grain, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woollen, silk, and cotton goods; and in these and other articles an active trade is carried on, chiefly with Hindustan. Many ancient ruins are scattered over the province. Pop., of which there are no trustworthy returns, estimated at 1,700,000.

FARSAN, two islands on the east side of the Red Sea, about lat. 16° 30′ N.; lon. 42° E., connected by a sandy shoal fordable by camels. The most westerly, called Farsan Kebeer, is 31 miles long, and the other, called Farsan Segheer, about 18 miles. The surface is diversified by hills composed of coral, and occasional valleys and plains.

FARTHING, the fourth part of a penny; the modern form of the Anglo-Saxon *feorthung*, the fourth part of anything.

FARTHINGALE, or Fardingale, an article of ladies' attire worn in the days of Queen Elizabeth, and closely resembling the modern crinoline. The queen's fardingale, according to Walpole, was of enormous size. The material of which the skeleton of the farthingale was composed was whalebone. It differed from the modern crinoline in protruding more at the waist, being more in the form of a cupola. This fashion has frequently recurred. It prevailed during the greater part of the eighteenth century, and also held sway for a succession of years in the nineteenth. It has always been found inconvenient to the extent of being a positive nuisance.

FASCES, among the ancient Romans, a bundle of polished rods, in the middle of which was an axe, to express the power of life and death. These fasces, the number of which varied, were carried before the superior magistrates by the lictors. The lictors were obliged to lower the fasces in the presence of the people, as an acknowledgment of its sovereignty. In the city the axe was laid aside; for the reason of which see Consul.

FASCINATION (Latin, *fascinare*, to kill with a look). For the exercise of fascination by human beings see Evil Eye.

The power of fascination, which has been attributed to some snakes (toads, hawks, and cats have been invested with it also), forms a curious chapter in natural history. The existence of this power was at one time universally believed in, and there are not wanting naturalists who still believe in it. The manner in which the supposed fascinating power is exerted is thus described by Dr. Barton of Philadelphia, who wrote a work on the subject, combatting the belief in fascination: 'The snake, whatever its species may be, lying at the bottom of the tree or bush upon which the bird or squirrel sits, fixes its eyes upon the animal which it designs to fascinate. No sooner is this done than the unhappy animal is unable to make its escape. It now begins to utter a most piteous cry, which is well known, by those who hear it, to be the cry of a creature enchanted. If it is a squirrel, it runs up the tree for a short distance, comes down again, then runs up, and, lastly, comes lower down. 'On that occasion,' says a credulous, though honest writer (Kalm), 'it has been observed that the squirrel always goes down more than it goes up. The snake still continues at the root of the tree, with its eyes fixed on the squirrel, with which its attention is so entirely taken up that a person approaching may make a considerable noise without the snake's so much as turning about. The squirrel always comes lower, and at last leaps down to the snake, whose mouth is already wide open for its reception. The poor little animal then, with a piteous cry, runs into the snake's jaws, and is swallowed at once.' Dr. Barton then combats the suppositions of Lacepède, that the effect thus described as produced may be owing to an infectious vapour emanating from the body of the snake, or to the animal having been previously bitten by the reptile (which Lacepède supposes may also cause its cries, its agitation, and finally its falling down); and that of Blumenbach, that curiosity or fear occasioned by the hissing and noise of the rattles impels the animal affected to approach the cause of the noise; and endeavours to show that the notion that any such fascinating power is possessed by any animal is entirely without foun-

dation. We find, however, the following remarks on this subject, introduced into a work of high reputation (Griffith's translation of Cuvier's Animal Kingdom, Reptilia): 'It has been almost universally believed that, by certain special emanations, by the fear which they inspire, or even by a sort of magnetic or magic power, the serpents can stupify and fascinate the prey which they are desirous to obtain. Pliny attributed this kind of asphyxia to a nauseous vapour proceeding from these animals—an opinion which seems to receive confirmation from the facility with which, by the assistance of smell alone, the negroes and native Indians can discover serpents in the savannahs of America.' The writer then mentions the opinions of Lacepède and Kalm, and the fact that many travellers have reported in favour of fascination. He then proceeds thus:—'But this fact, which is so interesting in animal physiology, is not only far from being clearly explained, but even far enough from being sufficiently demonstrated. Notwithstanding the ingenious conjectures of Sir Hans Sloane on this subject; the observations of Kalm, whose assertions were implicitly received by Linnæus; those of Lawson, Catesby, Brickel, Colden, Beverly, Bancroft, and Bertram; notwithstanding a work published *ex professo*, on the matter, by Dr. Barton, of Philadelphia; and notwithstanding remarkable accounts by Major Garden of the stupifying power of serpents, which he attributes both to the terror which they inspire and to certain narcotic emanations from their bodies at particular times—it must be confessed that this subject is still liable to controversy, and still involved in a considerable degree of obscurity. On the other hand, as the look of the dog stops the progress of the partridge, so we might imagine that the presence of man has a considerable influence over the faculties of some very justly dreaded serpents, and obliges them to obedience by, as it were, a certain kind of fascination. From the most ancient times certain hordes of Arabia, such as the Psylli and the Marsi, were acquainted with some art of charming and taming those reptiles. Kæmpfer, and many other travellers, have left us accounts of the dance which the Indians make the cobra perform. We also know, beyond any doubt, that the Egyptian jugglers cause the asp of the ancients, the *hâje* of the modern Arabs, to play a variety of tricks at the word of command, and that they seem to imitate the magicians of Pharaoh, who pretended to turn their rods into serpents. It is also a remarkable fact that music has a very considerable influence on these animals, to which we cannot otherwise attribute any large portion of sensibility.'

FASCINES (military art), bundles of boughs, twigs, &c., 16 feet in length, and usually 1 foot in diameter. They are made on trestles, or any kind of support placed about 2 feet asunder. The twigs are placed on this machine, drawn tightly together by a cord; the bands are then passed round them at the distance of 2 feet from each other. The twigs which exceed a given length are cut off or bent back, and the ends are bound into the bundle. Fascines are used in sieges, hydraulic constructions, &c. Very long thin ones are used in constructing batteries, whence they are called *saucissons* or *battery-sausages*.

FASHION (French, *la mode;* German, *mode*) is the term used in England to denote those constant changes in dress and usages which society from time to time adopts and imposes by a sort of arbitrary law upon its members. It is remarked by foreigners that the words *fashion* and *fashionable* in English have a more extended meaning than the corresponding words in other languages. It is said they extend not merely to dress, but to manners, and that these in their minutest details are, as the use of the word indicates, governed in England by fashion, that is to say, by the caprice of society, a caprice which in its turn is regulated in every grade of what calls itself society by the supposed manners (frequently, it may be, misapprehended) of the upper or aristocratic classes. On this account the words fashion and fashionable have been imported into the French and German languages, where they bear more or less of an ironical and sarcastic signification.

It is to be feared there is too much truth in this accusation. Whatever may be the case elsewhere, it is certain that English society enthrals itself in a too servile and quasi-superstitious adherence to mere arbitrary forms which have no intrinsic value (see ETIQUETTE), and even subjects itself to ridicule by the ludicrous character of the misconceptions to which usages temporarily prevalent may at times be traced. A great man, or a distinguished woman it may be, habitually does something or other for a particular reason. Because the individual is distinguished, the action is imitated without any reason. By-and-by the imitation becomes general, and then it is imposed as a rigid obligation. The unfortunate man or woman who enters society ignorant of this obligation inspires pity and contempt far greater than if he or she were guilty of the most flagrant violation of the decalogue. As soon, however, as this obligation dies out or is superseded by another from the same source, the pity or contempt will be transferred to him who continues to adhere to it. Usages of this kind, of which there is always a plentiful crop ready to spring up like mushrooms, are necessarily evanescent in their nature: thus an individual who is not duly attentive to watch the countenance of society is liable, within a very brief time, to incur its frown for not knowing to do and to omit the same action. Other phases of this thraldom, the ruinous expenses to which it puts innumerable persons in rivalling those above them in means, need not be dwelt on. It were much to be wished that not only in English, but in all other societies, all sensible men should set their faces against a servile adherence to any observance not founded on reason; a liberty the assertion of which would increase all social enjoyments and save much misery occasioned by social restraint as well as by reckless expenditure.

Even in dress, equipage, &c., the matters more strictly belonging to fashion, its rule is, it must be admitted, much too arbitrary. Those who have studied these matters observe that in the changes of dress and other matters subject to fashion there is a sort of cycle or periodical recurrence of usages. Where there is such a cycle there is usually progress. The same thing does not exactly recur, but recurs with modifications which may be considered improvements. Such cycles are observed in art, in literature, and even in human history itself. Progress by cycle may not be the most direct mode of progression, but it seems to be adapted to the constitution of human nature, or, at least, of human society, and may be accepted with resignation if not with enthusiasm. If, therefore, the movement of fashion were steadily cyclic, it might be submitted to with equanimity. But a very little observation will, we think, suffice to show that besides any cyclic movement there is another very active movement quite distinct from a cyclic one to which the changes of fashion are subject. This movement is not difficult to trace either in its nature or origin—it is a simple see-saw, and it originates with the *modistes*, who conduct it with great vigour for the purpose of preying upon the purse of society. This movement is much less observable in male than in female attire, but we select the former to illustrate it expressly on this account. We appeal

to the recollection of gentlemen who have never bestowed any special attention on their dealings with their tailors if they cannot recall a constant succession of little changes, a couple of inches more or less in the width of their coat-sleeves, or in the corresponding dimensions of other and less citable garments, a slight change in the form of a cuff, a collar, or a lapel, without the latest form of which they appear slightly uncomfortable in appearing in society. Why should there be any rigid uniformity in such matters? Why should I appear ridiculous if my sleeves are to-day an inch more or to-morrow an inch less than my neighbours'? To this question there can be only one rational answer. For the profit of the tailor; and the tailor, the milliner, the modiste, and the whole army of their congeners will continue to bleed society in this way as actively as society will let them. This is a matter in which the influence of individuals is necessarily limited. It is nevertheless ultimately regulated solely by individual action. There is a class of people who are ready to leap at every suggestion of their interested advisers. These are the indispensable agents of the modistes in introducing new fashions, and in proportion to their number and influence the whirl of innovation is more or less rapid. To exert a contrary influence it is not necessary that an individual should put himself to the trouble of resisting the opinion of his professional adviser in matters of fashion; but when, with the sanction of the constituted authority, he has selected any article subject to the control of the fickle goddess, he may reasonably insist on having the use of it, undisturbed by any new changes of opinion which in the meantime she may have imposed upon her constituted interpreters; and as the mere apathy of society is not sufficient to resist the zeal of the interested promoters of new fashions, a little ridicule might even be profitably expended on those who serve as their most facile instruments.

FASHION PIECES, the aftmost or hindmost timbers of a ship, which terminate the breadth, and form the shape of the stern. They are united to the stern post, and to the extremity of the wing transom by a rabbet and a number of strong nails or spikes driven from without.

FASTI (Latin, *fasti*, sacred days, from *fas*, divine law), marble tables in Rome, on which were inscribed either the succession of the annual games and festivals or the names of the consuls, dictators, &c. The former, the lesser fasti (*fasti minores*), were nothing more than calendars indicating the time of the festivals. These were at first known only to the *pontifices*, who announced them to the people to promote political purposes of their own or of the patricians. B.C. 204 C. Flavius, who had been secretary to the *Pontifex Maximus* Appius Claudius, exposed them to the people. From this time they were publicly known. Another species of tables, called *fasti historici*, formed a chronicle of contemporary events, containing the names of the chief magistrates of the year, and a series of the more remarkable events noted in the order of the days of their occurrence; their arrangement being similar to that of a calendar, they received the same name.

FASTING, the partial or total abstinence of mankind and animals from the ordinary requisite supply of aliment, by which is to be understood that quantity which is adapted to preserve them in a healthy and vigorous condition. The principal instances of fasting on record are those which have arisen from shipwreck, accidental imprisonment in mines, and similar accidents, from peculiar mental affections, or from the body being in a morbid state, or from the two latter combined. It would appear that various warm-blooded animals are capable of sustaining total abstinence much longer than human beings. There are pretty well authenticated instances of dogs and cats surviving for several weeks when accidentally confined in places where it was scarcely possible they could find nourishment. There are few well authenticated instances of human beings being starved to death by a continuous and total deprivation of nourishment, but the general opinion is that the average period during which such deprivation could be sustained does not exceed a week. The use of water, even its external application, or the use of small quantities of food even at protracted intervals, enables life to be sustained much longer. Abnormal conditions of body have frequently the same effect, but in some of these, as fever, while food is rejected, drink is partaken of freely. Habitual fasting for protracted periods more than six or eight hours is condemned by medical authority as injurious to health.

FASTS. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions. Among the Jews fasts were numerous; but they must have all been founded on tradition, except that of the day of expiation, which was appointed by Moses. We find, however, many instances of occasional fasting in the Old Testament. Herodotus says that the Egyptians prepared themselves by fasting for the celebration of the great festival of Isis. So in the Thesmophoria at Athens, and in the rites of Ceres in Rome, fasting was a part of the ceremony. Neither Christ nor his apostles give any precept respecting fasting. It was probably, however, early practised by the Christians as a private act of devotion. No public fast is spoken of in the most ancient times except that on the day of crucifixion. The Church of Rome distinguishes between days of fasting and of abstinence. The former are—1. The forty days of Lent; 2, the Ember days, being the Wednesday, Friday, and Saturday of the first week in Lent, of Whitsun week, of the third week in September, and of the third week in Advent; 3, the Wednesdays and Thursdays of the four weeks in Advent; 4, the vigils or eves of Whitsuntide, of the feasts of St. Peter and St. Paul, of the Assumption of the Virgin, of All Saints, and of Christmas day. When any fasting day falls upon Sunday it is observed on the Saturday before. The Greek Church observes four principal fasts: that of Lent, one beginning in the week after Whitsuntide, one for a fortnight before the Assumption, one forty days before Christmas. The Church of England appoints the following fixed days for fasting and abstinence, between which no difference is made:—1. The forty days of Lent; 2, the Ember days, at the four seasons; 3, the three Rogation days before Holy Thursday; 4, every Friday except Christmas day. Other days of fasting are occasionally appointed by royal proclamation. The church, however, gives no directions concerning fasting; and the ordinance of Parliament prohibiting meat on fast days was designed for the encouragement of fisheries and navigation.

FATALISM (from *fate*, and that from Latin *fatum*, something spoken), the belief in fate, or an unchangeable destiny, to which everything is subject, uninfluenced by reason, and pre-established either by chance or the Creator. See NECESSITY, PREDESTINATION.

FATA MORGANA, a singular aerial phenomenon seen in the Straits of Messina. When the rising sun shines from that point whence its incident ray forms an angle of about 45° on the Sea of Reggio, and the bright surface of the water in the bay is not disturbed either by the wind or current, when the tide is at its height, and the waters are pressed up by currents to

a great elevation in the middle of the channel, the spectator being placed on an eminence, with his back to the sun, and his face to the sea, the mountains of Messina rising like a wall behind it, and forming the back-ground of the picture, on a sudden there appear in the water, as in a catoptric theatre, various multiplied objects—numberless series of pilasters, arches, castles, well delineated, regular columns, lofty towers, superb palaces, with balconies and windows, extended alleys of trees, delightful plains, with herds and flocks, numbers of men on foot or on horseback, and many other things, in their natural colours, and proper actions, passing rapidly in succession along the surface of the sea during the whole of the short period of time that the above-mentioned conditions remain. All these objects which are exhibited in the Fata Morgana are proved by the accurate observations of the coast and town of Reggio by P. Minasi to be derived from objects on shore. If, in addition to the circumstances we before described, the atmosphere be highly impregnated with vapour and dense exhalations, not previously dispersed by the action of the wind and waves, or rarefied by the sun, it then happens that in this vapour, as in a curtain extended along the channel to the height of above forty palms, and nearly down to the sea, the observer will behold the scene of the same objects not only reflected from the surface of the sea but likewise in the air, though not so distinctly or well defined as the former objects on the sea. Lastly, if the air be slightly hazy and opaque, and at the same time dewy, and adapted to form the iris, then the above-mentioned objects will appear only at the surface of the sea, as in the first case, but all vividly coloured or fringed with red, green, blue, and other prismatic colours. As the day advances the fairy scene gradually disappears. A very singular instance of atmospherical refraction is described in the Philosophical Transactions as having taken place at Hastings, England. The coast of Picardy, which is between 40 and 50 miles distant from that of Sussex, appeared suddenly close to the English shore. The sailors and fishermen crowded down to the beach, scarcely believing their own eyes; but at length they began to recognize several of the French cliffs, and pointed out places they had been accustomed to visit. From the summit of the eastern cliff or hill a most beautiful scene presented itself: at one glance the spectators could see Dungeness, Dover cliffs, and the French coast all along from Calais to St. Vallery, and, as some affirmed, as far to the westward even as Dieppe. By the telescope the French fishing-boats were plainly seen at anchor, and the different colours of the land on the heights, with the buildings, were perfectly discernible. This refractive power of the atmosphere was probably produced by a diminution of the density of its lower stratum in consequence of the increase of heat communicated to it by the rays of the sun powerfully reflected from the surface of the earth. (See MIRAGE.) Similar appearances occur also in the great sandy plains of Persia, of Asiatic Tartary, in Lower Egypt, on the plains of Mexico in North America, &c.

FATES (in Latin, *Parcæ;* in Greek, *Moirai*, from a root signifying to divide or portion out), the inexorable sisters who spin the thread of human life. Homer mentions neither their separate names nor their number. The appellation *Clotho* (the spinner) was probably at first common to them all. As they were three in number, and poetry endeavoured to designate them more precisely, *Clotho* became a proper name, as did also *Atropos* and *Lachesis*. Clotho means she who spins (the thread of life); Atropos signifies unalterable fate; Lachesis, lot or chance; so that all three refer to the same subject under different points of view. In Homer and Hesiod they appear as goddesses of human fate and individual destiny, both in life and death. Among the lyric poets they seem to have a general power over events, and are always present where anything is to be divided. In the narrowest signification they are the goddesses of death, as of that destiny which closes the scene with all. In this capacity they belong to the infernal world, and are daughters of Erebus and Night. As goddesses of fate they are the servants of Zeus and the offspring of Zeus and Themis. The former genealogy is the more modern. As daughters of Zeus, they have a share in the decisions of fate, and are commissioned by him to execute his commands. They regulate the future events in the life of man. They know and predict what is yet to happen. Lachesis is represented with a spindle, Clotho with the thread, and Atropos with scissors, with which she cuts it off. We find in the northern mythology three beautiful virgins, the *Nornen*, who determine the fate of men. Their names are *Urd* (the past), *Varande* (the present), and *Skuld* (the future). See NORTHERN MYTHOLOGY.

FATHERS OF THE CHURCH. See CHURCH (FATHERS OF THE).

FATHOM, a unit of length equal to 6 feet. It is chiefly used by sailors, who measure soundings, &c., in fathoms.

FATIMITE DYNASTY, a line of caliphs, pretended descendants of Fatima, the favourite daughter of Mohammed and of Ali her cousin, to whom she married. In the year 909 Abu-Mohammed Obeid-alla, giving himself out as the grandson of Fatima, endeavoured to pass himself off as the Mahady or Messiah predicted by the Koran. Denounced as an impostor by the reigning caliph of Bagdad he fled into Egypt, was captured and thrown into prison, but was soon liberated by the usurper Abu-abd-Alla, who seated himself on the throne held by the Aglabite dynasty for over a hundred years. The pretended Mahady was made caliph of Tunis, and his soldiers being animated with the idea that he was a messenger from heaven, he soon conquered all Northern Africa, from the Straits of Gibraltar to the borders of Egypt. His son and successor gained possession of the island of Sicily, and Moez, the fourth caliph, wrested Egypt from the Abbassides in 970, founded Cairo, and fixed his residence in its present suburb of Fostat. He subsequently acquired Palestine and a great part of Syria. His successor Aziz (975–996) consolidated his conquests, embellished Cairo with many monuments, and married a Christian, whose brothers he made patriarchs of Alexandria and Jerusalem. His son Hakem (996–1021) has rendered himself famous for his merciless persecution of the Christians, Jews, and orthodox Mohammedans, and gave the first impulse to the Crusades by his tyrannical conduct at Jerusalem. Declaring himself a manifestation of God, he became towards the close of his reign the founder of a new religion, now represented by the Druses in Syria, who expect his re-appearance as their Messiah. From his time the power of the Fatimites declined. On the death of Adhed, the fourteenth caliph, in 1171, the dynasty was extinguished, and a new one established by Saladin.

FATS. The fats and fatty oils are mixtures of various glycerin ethers, which are found both in plants and animals, the term fat being confined to those which are solid at the ordinary temperature, and oil to those which are fluid. In plants the fatty portion is found chiefly in the seeds, inclosed in small cells, but also in the pulpy part of the fruit, and is separated by pressure or trituration; in animals it is deposited in the cellular tissue, and is most easily separated by heating with water, when the fat melts, rises to the surface, and forms on cooling a cake

which is easily removed. There is no essential difference in the character of the fatty matters derived from the two kingdoms, though the fats themselves, for example, mutton suet, whale-oil, or hog's lard, may differ in the proportions of their proximate constituents. Generally, however, the vegetable fats are fluid, though containing solids; while the animal fats are usually solid, containing, however, some fluid portions, the exceptions being whale, sperm, seal, and fish oils. (See OILS.) Animal fats are easily separated into their liquid and solid portions by pressing them between folds of bibulous paper, the liquid or oil being absorbed, while the solid fat remains. By after treatment with water the oil is separated from the paper. To this portion the name *elain* or *olein* (which see) has been given, and to the solid fat *stearin* and *margarin*, which is a mixture containing palmitin and other glycerides. These bodies are respectively produced by the reaction of oleic, stearic, palmitic, and other fatty acids with glycerin, and the compounds are decomposed by an aqueous solution of potash or soda, and other metallic hydrates, the bases combining with the fatty acids, and liberating the glycerin. (See GLYCERIN and SAPONIFICATION.) A similar decomposition is even effected by superheated steam, and by sulphuric acid. In the latter case the acid combines with the glycerin, but sometimes also with the organic acids.

The fats are white or yellowish, have a slight taste, and sometimes a characteristic odour, are insoluble in water, but dissolve somewhat in alcohol, and readily in ether, benzol, turpentine, and bisulphide of carbon. They differ to some extent in their fusion points, but all melt readily, and can be heated to between 400° and 500° Fahr. without change. Above that temperature they decompose, evolving inflammable gases, and a variety of hydrocarbons, acids, and acrolein, which has a most pungent odour, and is produced by the decomposition of glycerin. The fats are therefore incapable of distillation, and are thus distinguished from the volatile or essential oils. For the same reason they leave a permanent translucent stain on paper, which cannot be removed by heat. Their specific gravity is rather less than that of water. They act as solvents for sulphur, phosphorus, and other bodies which are insoluble in water, and are absorbed to a considerable extent by moist leather and by moist clay. When exposed to the air the fats and fatty oils absorb oxygen and undergo various changes. Some of the oils, for example, change to a solid, transparent mass; these are the drying oils. Some of the fats, on the other hand, especially if they have not been properly purified from mucous or albuminous matter, become rancid. This appears to be due to a sort of fermentation.

FATTY ACIDS, the most complete and perhaps the most fully studied homologous series of bodies in organic chemistry. The series has derived its name from the fact that the different acids are obtained from fats and oils by saponification with a base, and by decomposing with a stronger acid the salt of the acid formed. The acid can then be separated by distillation or by extraction with a solvent and crystallization. The following table comprises the fatty acids so far as known, with the alcohols corresponding:—

		Fusion Point.	Boiling Point.	Alcohol.	Sources.
Formic Acid,	CH_2O_2	1° C.	100° C.	Methylic,	Ants.
Acetic,	$C_2H_4O_2$	17° C.	117° C.	Ethlyic,	Plants and animals; oxidation of alcohol.
Propionic,	$C_3H_6O_2$	..	141° C.	Propylic,	Fermentation.
Butyric,	$C_4H_8O_2$	..	164° C.	Butylic,	Tamarinds; fermentation.
Valerianic,	$C_5H_{10}O_2$	..	175° C.	Amylic,	Valerian root.
Caproic,	$C_6H_{12}O_2$	..	200-205° C.	Hexylic,	Butter; cocoa-nut oil.
Œnanthic,	$C_7H_{14}O_2$	..	212° C.	Heptylic,	From castor-oil.
Caprylic,	$C_8H_{16}O_2$	14° C.	236° C.	Octylic,	Cow's milk.
Pelargonic,	$C_9H_{18}O_2$	18° C.	260° C.	Nonylic,	Geranium.
Capric,	$C_{10}H_{20}O_2$	30° C.	..	Decatylic,	Butter; cocoa-nut oil.
—	—	—	—	—	—
Lauric,	$C_{12}H_{24}O_2$	43·6° C.	..	..	Bay-tree fat.
—	—	—	—	—	—
Myristic,	$C_{14}H_{28}O_2$	53·8° C.	..	..	Dika bread, nutmeg butter, &c.
—	—	—	—	—	—
Palmitic,	$C_{16}H_{32}O_2$	62° C.	..	Cetylic,	Palm-oil; Chinese tallow, &c.
Margaric,	$C_{17}H_{34}O_2$	59·9°? C.	..	..	Artificial.
Stearic,	$C_{18}H_{36}O_2$	69·2° C.	..	..	Beef and mutton suet.
—	—	—	—	—	Shea butter.
Arachidic,	$C_{20}H_{40}O_2$	75° C.	..	..	Oil of earth-nut.
—	—	—	—	—	—
Behenic,	$C_{22}H_{44}O_2$	76° C.	..	..	Oil of ben.
—	—	—	—	—	—
Cerotic,	$C_{27}H_{54}O_2$	78° C.	..	Cerylic,	Bees'-wax.
—	—	—	—	—	—
Melissic,	$C_{30}H_{60}O_2$	88° C.	..	Melylic,	Bees'-wax.

Besides this there is another series containing acrylic, oleic, brassic, doeglic and other acids, which are equally entitled to the appellation of fatty, both because they are obtained from oils or fats, are themselves of oily character, and when decomposed yield acids belonging to the previous series. As, however, they have a different composition, they are not included in the true fatty series, but are distinguished as the *Acrylic* series. The fatty acids, in addition to the natural sources above mentioned, can also be prepared artificially by certain typical reactions. The higher members also admit of isomeric variations; some of these have been prepared, but in one or two cases the acid naturally met with is not normal but is an isomer.

FATUITY. See INSANITY.

FAUCIGNY, a district of France, department of Haute Savoie, 36 miles long by 21 miles broad, and with an area of about 840 square miles. It is one of the loftiest districts of Europe, being partly traversed by the Pennine Alps, belongs almost entirely to the basin of the Arve, and has not more than one-third of its surface fit for culture. Pop. 102,000.

FAULT, in geology, a fracture of strata, accompanied by a sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently met with in the English coal beds, the miner coming unexpected upon an abrupt wall of other strata. The angle this makes with the plane of the bed he is working indicates whether he must look up or down for its continuation on the other side of the fracture,

the lowest level being almost always on the side of the obtuse angle. See GEOLOGY.

FAUN, the name given to the Roman gods of the woods, that is, a kind of spirits inhabiting the forests and groves, who were particularly reverenced by the cultivators of the ground. Their form was principally human, but with a short goat's tail, pointed ears, and projecting horns. They were clothed in the skin of a goat, or that of some other beast. They are sometimes crowned with vine branches, because, like the satyrs, they belonged to the train of Bacchus. Among the most famous antique statues of fauns are the old dancing faun in the Florentine Museum, and the young faun represented as a flute-player. The poets describe them as deformed and sensual; and we recognize this character in the ancient statues which have come down to us. They were considered as the sons of Faunus, who was reverenced as one of the most ancient kings of Latium, and was celebrated for his power of prophecy.

FAUNA (from *Faun*, which see), a collective word signifying all the animals of a certain region, and also the description of them, corresponding to the word *flora* in respect to plants.

FAURIEL, CHARLES CLAUDE, a French historian and critic, born at St. Étienne, 1772, and educated at Tournon and Lyons. He adopted eagerly the principles of the revolution, and served in the capacity of lieutenant under La Tour d'Auvergne. In 1794, after a year's service, he quitted the army, and in 1800 became secretary to Fouché, the minister of police, a position he resigned two years later, when he saw Napoleon making rapid strides to despotic authority. He had, meanwhile, made acquaintance with several literary celebrities, among others Mme. de Staël, Condorcet, and De Gerando, and devoted particular attention to the oriental languages. In 1810 he published a translation of the Parthenais of the Danish poet Baggesen, and soon afterwards two of the tragedies of Manzoni. In 1824–25 he published an edition of the Popular Songs of Modern Greece, giving the text with translations and valuable annotations. This work appeared during the Greek struggle for liberty, and increased the interest the French had shown in favour of the Hellenes. The revolution of 1830 placed some of his friends in power, and he obtained the chair of foreign literature in the Faculty of Letters at Paris. In 1836 appeared the first four volumes of his History of Southern Gaul under the Rule of the German Conquerors, a work which procured him the membership of the Academy of Inscriptions and Belles Lettres. He was one of the collaborateurs in the literary history of France, to which he contributed a valuable notice on Brunetto Latini. As joint conservator of the manuscripts in the Royal Library, he published a History of the Crusade against the Albigensian Heretics, a poem in the Provençal dialect, to which he added a translation and introduction. His last work, a History of Provençal Poetry, appeared two years after his death, which occurred in 1844.

FAUST, or FUST, JOHANN, a goldsmith of Mentz, one of the artists to whom the invention of printing is generally ascribed. It is, however, doubtful if he did more than advance money to Gutenberg, who had previously made some attempts with carved blocks at Strasburg. The third person concerned was Schöffer, who married the daughter of Faust, and who is allowed the honour of having invented punches and matrices, by means of which this grand art was carried to perfection. The first-fruits of the new process was Durandi Rationale Divinorum Officiorum, published by Faust and Schöffer in 1459, which was followed a year or two after by the Catholicon Johannis Januensis; after which, in 1462, succeeded the Bible, so much sought for by those fond of early specimens of typography. These works were, however, preceded by a Bible, Psalter, and other books, executed with characters engraved on wood, and by a mechanism which Faust and Schöffer possessed in common with Gutenberg. It has been pretended that when Faust went to Paris to sell a second edition of his Bible of 1462, he was arrested at the instigation of the monks, who saw in the invention of printing the destruction of their profitable monopoly in manuscript copying; and that he was condemned to death for the production of books by magic; but this story appears to be mere fable. There is reason to believe that he died of the plague in 1466, as the name of Schöffer alone is found in the books printed after that time at Mentz. Owing, perhaps, to a similarity of name some of the noted deeds of Dr. Faust have been ascribed in popular German legends to the printer.

FAUST, DOCTOR JOHN, a celebrated dealer in the black art, who lived in the beginning of the sixteenth century. Dr. Faust has become in Germany one of those standing national characters which represents a whole class of persons, and to whom every new invention and strange adventure is constantly attributed. According to some accounts he was born at Knittlingen, in Suabia; others make him a native of Anhalt; others of Brandenburg. The first account is the most probable. In his sixteenth year he went to Ingolstadt, and studied theology, became in three years a *magister*, but abandoned theology, and began the study of medicine, astrology, and magic, in which he likewise instructed his familiar Johann Wagner, the son of a clergyman at Wasserburg. After Dr. Faust had spent a rich inheritance left him by his uncle, probably in chemical and alchemical experiments, he, according to tradition, made use of his power to conjure up spirits, and entered into a contract with the devil for twenty-four years. A spirit called *Mephistopheles* was given him as a servant, with whom he travelled about, enjoyed life in all its forms, and surprised people by working wonders; for instance, he rode on a wine barrel out of Auerbach's cellar in Leipzig, in 1523, where an old painting representing the subject is still to be seen. The evil spirit finally carried him off near the village of Rimlich, between twelve and one o'clock at night. This is the story as it is found in a work by G. R. Wiedemann, True History of the Horrible Sins of Doctor John Faustus, Hamburg, 1599; and in another old book, the League of Doctor Faust, the Enchanter and Sorcerer known throughout the World, with the Devil, his adventurous Life and terrible End, printed at Cologne and Nuremberg. Some have entirely disbelieved his existence; but Melanchthon, Tritheim, and others, knew him personally. Perhaps he was a chemist more acquainted than others of his age with his science. Even yet Dr. Faustus and his familiar Wagner play a conspicuous part in the puppet-shows of Germany; and this legend has not only remained among the lower classes, but is incorporated with some of the finest productions of the German muse. The most distinguished poems on this subject are Klinger's Faust's Leben, Thaten und Höllenfahrt (Faust's Life, Deeds, and Descent to Hell), and Goethe's celebrated Faust. As early as 1590 the legend was dramatically treated in England by Christopher Marlowe.

FAUSTINA: 1. The wife of the Emperor Antoninus Pius; and 2, her daughter, who was afterwards married to the Emperor Marcus Aurelius Antoninus. The historians of the period have interspersed their descriptions of the flourishing state of the empire under these Antonines with scandalous anecdotes of their wives. But in vindication of the younger

Faustina, who was accused of the grossest excesses, it cannot be denied that her own husband Marcus Aurelius, who, by his excellent character, and his devotion to philosophy, obtained the surname of the philosopher, gave her the credit of being an exemplary wife. Wieland has attempted to defend her against the invectives of the historians of the emperors.

FAVART, CHARLES SIMON, creator of the serio-comic opera in France, born 1710, was the son of a pastry-cook. Favart received part of his education at the college of Louis-le-Grand, and devoted himself to poetical pursuits. His first poem—La France delivrée par la Pucelle d'Orléans, obtained the prize in the Jeux floraux. But his poetical reputation rests principally on his numerous productions for the *opéra aux Italiens*, and the comic opera. The latter, with which Favart was closely connected, was suppressed in 1745, through the intrigues of the former, which was jealous of its success; and Favart was obliged to assume the direction of a company of itinerant actors, which followed Marshal Saxe into Flanders. He was often obliged to use his talents before an engagement or any other important event, to encourage the army. An instance of this sort occurred before the battle of Rocoux, when the poet, at the request of the marshal, hastily composed some verses, announcing victory in the impending contest, which were sung by a favourite actress during the interval between the acts. Favart had the grief to see that the charms of his wife had conquered the victor of Fontenoy, who, on his advances being repulsed, basely used his power to persecute her husband, and cause her, by means of a *lettre de cachet*, to be confined more than a year in a convent in the country. Shortly after the death of the marshal, Favart returned to the capital, and applied himself assiduously to dramatic poetry. He wrote at this period, in conjunction with the Abbé Voisenon, a number of his best productions, in the composition of which Madame Favart also participated. In most of them Favart himself formed the plan, the style, characters, and dialogue, while his wife added many strokes of *naïveté* and feminine sprightliness; but from the abbé, who was much overrated in his time, came those affected quibbles and cold conceits which occur in some of Favart's works. The number of his works is very great; and many of them, as for instance Soliman II., or the Three Sultanesses, Ninette à la Cour, La Chercheuse d'Esprit, l'Astrologue de Village, &c., have been translated into foreign languages. He died, 1792, at the advanced age of eighty-two years. Original and lively ideas, graceful and natural expression of tender feeling, a skilful delineation of characters mostly rural, and a pure and easy diction in verse as well as prose, are the attributes of Favart's muse.

FAVERSHAM, a municipal borough and seaport of England, county Kent, on a branch of the Swale, 45 miles E.S.E. of London. It consists principally of four spacious streets, with a market-place in the centre, and there are three suburbs adjacent to the town, one of them on the opposite side of the creek. It has a handsome cruciform church, various denominational chapels, a literary institute with a lecture-hall and reading-room, &c., a recreation ground of 20 acres, &c. The chief manufactures are gunpowder and Roman cement, and there is a valuable oyster fishery. Vessels of 200 tons come up to the town, importing timber, iron, coal, &c., and exporting corn, hops, fruit, wool, &c. Pop. 7198.

FAWKES, GUY. See GUNPOWDER PLOT.

FAY, ANDRÁS, a Hungarian poet, born at Kohany, in the county of Zemplén, in 1786. He was educated for the bar, but renounced that profession for the more congenial one of literature. His first venture in his new career was a collection of poems which were highly esteemed, but which were eclipsed in public favour by his Book of Fables, published in 1820. Soon afterwards he plunged into the sea of politics, and became one of the most vigorous opponents of the illiberal policy of Metternich, until the more uncompromised action of Kossuth induced the timid literary student to retire from public life. He varied his tasks as an author by attempts to establish a national theatre at Pesth and organizing savings'-banks, the first of which, in the Hungarian capital, owes its origin to his exertions. Besides his fables and poems he published some dramas (among the best of which is Doctor Javor and his Servant Ambrose Bakator) and several treatises on political economy. He died in 1864. A collection of his works, in eight volumes, was published in 1843–44, at Pesth.

FAYAL, one of the Azores, lon. 28° 41′ W.; lat. 38° 31′ N. It is of a circular form, about 10 miles in diameter, rising abruptly from the sea, reaching, in the centre, to the height of 3000 feet. The climate is good and the air always mild and pure. The cold of winter is never felt, and the heat of summer is tempered by refreshing winds. It produces plenty of pasture for cattle; birds are numerous, and plenty of fish is caught on the coast. The chief place is Villa Horta, or Orta. The origin of the island is volcanic. The soil is very fertile. It produces, in abundance, wheat, maize, flax, and almost all the fruits of Europe. Oranges and lemons abound. It has an important commerce with Europe and America. The population is reckoned at 31,000.

FAYALITE, a mineral found in the volcanic rocks of Fayal. It is opaque, green or brown, sometimes iridescent, and consists chiefly of ferrous silicate, but with small quantities of magnesia, lime, and the oxides of manganese, copper, lead, and aluminium. It is magnetic, fuses before the blowpipe, and is readily acted on by nitric acid. It has been met with also at different localities in Ireland. A substance closely resembling it has been formed artificially.

FAYENCE. See FAIENCE.

FAYETTE, GENERAL LA. See LAFAYETTE.

FAYETTE, MARIE MADELEINE, COUNTESS DE LA. See LAFAYETTE.

FAYETTEVILLE, a post town of North Carolina, capital of Cumberland county, near the west bank of the north-west branch of Cape Fear River. It has a pleasant and advantageous situation at the head of steamboat navigation. The situation is healthful and favourable for trade and manufactures. The land around is considerably elevated, and the soil dry and barren, except on the water-courses, where it is rich. Pop. 4660.

FAYOUM, a province of the northern part of Central Egypt, separated by mountains from the Libyan desert. Its superficies contains about 500 square miles. The soil is alluvial, and, in the north, particularly fertile. The western part, in which is situated Lake Birket el Karûn, was in former times well cultivated, but is at present covered with sand. Fayoum is irrigated by canals coming from the Canal of Joseph, but they are badly taken care of, and the province cannot any longer compete with the Delta. In the best watered parts rice, barley, rye, and flax are cultivated. The linen of Fayoum is highly esteemed. There are also cotton manufactories, which consume all the cotton raised in Fayoum, besides some brought from Cairo and Lower Egypt. Commerce is carried on with Cairo by caravans, which carry shawls, otto of roses, figs, dates, linen cloths, &c., and exchange them for cotton, soap, cloth, &c., from Europe. The chief town of the province is Medinet-el-Fayoum. Pop. of province, 143,400.

FEATHER ALUM, a name given to native hydrated sulphate of aluminium found in the United States, in Chili, in New South Wales, and other places, and to the double sulphate of aluminium and iron produced by the weathering of pyritiferous shales, and found at Hurlet, in Scotland, and at various foreign localities. Both substances crystallize in fine fibres, giving a feathery appearance to the rock in which they occur.

FEATHERS, the form which the dermal appendages assume in birds, agreeing in mode of development, but differing in form from hairs and scales. The parts of a feather, such as that of which a quill-pen is made, are the axis (*scapus*) and the lateral appendages. The scapus consists of a hollow cylinder or quill (*calamus*), and a four-sided solid portion (*rachis*). On either side of the rachis are the *barbs*, and these, with the rachis, make up the *vane* (*vexillum*) of the feather. The barbs are flat plates attached so that their planes are at right angles to the axis of the shaft. On the edges of the barbs are set the *barbules*, which interlock with those of adjacent barbs, and thus give strength to the vane. The calamus has an aperture at its lower end, and another on the under side, where the calamus joins the rachis, the latter being grooved from this point to the tip. The feather is developed on a papilla which is grooved vertically and transversely, these grooves being the moulds in which the horny matter of shaft and barbs respectively is deposited, the tubular barrel being the sheath of the papilla, which communicates with the interior of the growing feather by the lower opening of the calamus, just as the pulp of a growing tooth receives nourishment from the papilla by an orifice in the tip of the fang. Usually the mould of the feather is only on one side of the papilla; but when it is present on both sides the feather has an *after-shaft* (*hyporachis*), which is usually smaller than the chief vane. The description just given is that of a *contour-feather* or *penna*, as in the wing or tail. A *plumule* of down consists of a vane with a very small shaft; a *penno-plumule* has a larger shaft; and a *filoplume* has a very small vane on a long slender shaft: in these three kinds, which are protective, and take no part in flight, the barbs are not fastened together. The feathers of birds are periodically changed. This is called *moulting*. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again; and a bird whose wings have been clipped remains in that situation till the next moulting season, when the old stumps are shed, and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks. The *powder down patches* of the heron are plumules which break off into powder as they are developed. The inhabitants of the high northern latitudes use the skins of several sorts of water-fowls, with the feathers on, as clothing. The Greenlander makes use of the eider-duck, wearing the feathers next to the body, and thus endures the extreme cold of his climate. The ancient Mexicans formed various kinds of pictures, in the manner of mosaic, from the splendid feathers of the humming-bird; but they were necessarily very imperfect. Feathers make a considerable article of commerce; particularly those of the ostrich, heron, swan, peacock, goose, &c., for plumes, ornaments, beds, pens, &c. Geese are plucked in some parts of Great Britain five times in the year; and in cold seasons many of them die by this barbarous custom. Those feathers that are brought from Somersetshire are esteemed the best, and those from Ireland the worst. The best method of curing feathers is to lay them in a room exposed to the sun, and when dried to put them in bags and beat them well with poles, to get off the dirt.

FEATHERS, Composition of. Feathers have been often analyzed, but few bodies of definite character have been obtained from them. The whole feather consists of carbon, hydrogen, nitrogen, oxygen, and sulphur, and both when acted on by strong acids, and when distilled destructively, yields the decomposition products of protein compounds in general. The feathers of some birds contain silica in considerable proportion, while the red spots on the wings of the *turaco* have been shown to contain copper. The colouring matters in other cases are of organic origin, but very little is known about them.

FEBRICULA. See Fever.

FEBRUARY, from the Roman goddess *Febris* or *Februa*, who presided over the purifications (for example, for lying in), and is sometimes confounded with Juno. It is the second month in the year, and has twenty-eight days, except in leap-year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal to July in number of days. In this month the Romans held a feast called Februalia or Lupercalia, which lasted from the 18th to the 28th of February, and in which purifications were practised by the living, and a kind of expiatory sacrifices offered for the dead.

FÉCAMP, a town, France, in the department of Seine-Inférieure, at the mouth of a stream of the same name, 23 miles north-east of Havre. It stretches along a narrow hollow, inclosed by two parallel ranges of hills, and has a parish church, which originally belonged to the famous abbey of Fécamp, a school of hydrography, manufactures of cotton, linen, and woollen goods, sugar-works, tanneries, building-yards, several mills, a valuable fishery, and a spacious harbour with deep water and good anchorage. The town was celebrated for its herring fishery as early as the thirteenth century. Pop. 12,832.

FECULA, a name applied to all kinds of starch. See Starch.

FECUNDATION OF PLANTS. See Botany —Reproductive Organs.

FEDERAL GOVERNMENT. Federal is derived from the Latin *fœdus*, a league, treaty, covenant, and applied to the governments of confederations, which consist of several united sovereign states, as, for instance, the Swiss Republic, the United States of North America, Mexico, &c. The degree to which such states give up their individual rights as sovereign bodies may be very different. Thus the old German Empire was a confederation under a head, and yet one member of it might wage war with another; whilst the different members of the United States have given up, among other things, all political power in so far as it relates to foreign affairs. In the Swiss Confederation the different members are allowed to conclude treaties with foreign powers, if they are not expressly prohibited by the constitution. It must be observed that every confederation has not a federal government, because sometimes a confederation consists merely of a union between a number of states, not stricter than a treaty, defensive and offensive, between two states, as, for instance, the late Germanic Confederation.

FEE, in law, or *feudum*, properly signifies an inheritable estate in land, held of some superior, or lord; and in this sense it is distinguished from *allodium*, which is the absolute property in land. It is the theory of the English law that all the lands of the

kingdom, except the royal domains, are held in fee, or by a tenure, of some superior lord, the absolute or allodial property being only in the king, so that all the tenures are strictly feudal. This was a very significant practical doctrine while the feudal system flourished in Europe in all its vigour; and the remnants of it are still blended, in a greater or less degree, in the land titles, but rather as a theoretical doctrine, from which certain inferences are drawn, than a plain, direct, practical fact; for the property of the proprietor in land held in fee-simple, in England, is as absolute, to all intents and purposes, as where the land titles are allodial, there being no practical or theoretical doctrine of a tenure, or holding under a superior. In all countries property in lands, as well as chattels, is derived through the laws, and is guaranteed by the government; and universally the property, in both lands and chattels, reverts to the government, in case of there being no person who can claim it, either as an heir or purchaser; though, in respect to personal property, the government does not always avail itself of the right, but grants the property to persons who find it, in certain cases. But this right to inherit, or succeed to property, in the absence of all other claimants who have any right, is not what is meant by the theoretical, abstract property which the king is supposed to have in all the lands of the kingdom, but of which he cannot now avail himself, in respect to a great part of them, to any practical purpose whatever.

The amplest estate is that of a fee-simple, and such an estate can be had only in property that is inheritable and of a permanent nature; for we speak of a fee-simple in lands and franchises, but never in ships or goods. Though tenements are said to be possessed in fee-simple, yet this is in reference to the land, which includes things attached to it; but if one puts a building upon another's land by his permission, the building is his personal property, in which he cannot have a fee-simple; but if he puts it on his own land, he then may have a fee-simple in the land and tenement, considered as one subject. A fee-simple is the estate out of which other lesser estates are said to be carved; as a fee-conditional, such as a fee-tail (see ENTAILS), and a base fee, which is also, in effect, a conditional fee; as if lands be granted to certain persons, tenants of D, who are to have the lands only as long as they continue to be tenants of D: this is a base fee. A conveyance to a grantee and his heirs generally, and without qualification, gives a fee-simple; but if the estate be limited to certain heirs, or limited in time, or have any condition or qualification which may defeat or terminate it, it is something less than a fee-simple.

FEEJEE. See FIJI.

FEELING is properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It thus includes all the senses which are reducible to modifications of touch. But popularly feeling is restricted to what is known as common sensation, or the sensibility of the general surface of the body to impressions produced by touch, as well as to the sensitiveness of certain organs, as the periosteum of bone. Feeling in this sense is diffused over the whole surface, and in man the different impressions by contact are apprehended by certain structures with which the extremities of the nerves are connected, these auxiliaries being most numerous on the most sensitive parts as the finger-tips, and the lines where skin and mucous membrane pass into each other. These structures are papillæ or conical elevations of the derma in which the nerves end, and which are richly supplied with blood-vessels. Touch corpuscles are enlargements of the sheath of the nerve which surround its extremity. Touch is rarely exercised without another impression, the sense resistance, or the muscular sense, being called into play. The feeling possessed by periosteum and bone, when injured, is manifested as pain, but of other impressions equally powerful we are not conscious. Thus impressions made on the terminal filaments of the sympathetic system do not manifest themselves as pain which we can localize, unless the injury is very severe, as in some diseases of the intestines. Many disturbances of internal organs manifest themselves only by 'sympathetic' phenomena, as pain in the shoulder when the liver is irritated, in the arm when the heart is affected, and the like. Special apparatus is not essential to the exercise of common sensation, though it may help in the analysis of impressions. Thus some of the lower animals, as Protozoa, in which hitherto no organs have been detected, respond to impressions by contact. Here there is neither *afferent* nerve to carry impressions inwards, nor a *centre* to receive impressions and transmit the appropriate stimulus, nor *efferent* nerves to convey that stimulus. The reflex act of withdrawing from contact, as does the foot of the sleeper when it is touched, cannot in the animal, however, be put down as the result of displacement of the granules and fluids of which its body is composed, though in the sensitive-plant and sundew the shrinking under irritation is due to as purely a mechanical operation as the drooping of hygrometric moss in drought, its erecting itself when moisture is applied.

FEITH, RHYNVIS, one of the first modern poets of Holland, and with Bilderdyk the restorer of degenerated Dutch poetry, was born at Zwoll in Over-Yssel, in 1753. He early displayed the happiest talents for poetry, and, after having studied law at Leyden, resided from 1770 in his native city, and pursued his favourite studies. He was made burgomaster, and afterwards receiver at the admiralty college in Zwoll, but did not cease to cultivate the art of poetry, and to enrich Dutch literature by excellent works. Several of his works obtained prizes from the literary societies of Holland. The Poetical Society of Leyden awarded to him the two first prizes for two poems in memory of Admiral Ruyter. He tried his powers in almost every department of poetry. In his earlier years he was too much inclined to the pensive and sentimental style of Bellamy (which see). It predominates particularly in his romance Ferdinand and Constantia (1785), and, through his example, has for a long time prevailed in Holland. His Grave (Het Graf, 1792) is the first distinguished didactic poem since the revival of Dutch poetry. This poem, with a good plan, with many excellent passages, and charming melody, has also too much of the melancholy character. His Old Age (De Ouderdom, 1802) is free from this fault, but has no definite plan. Among his lyric poems, Oden en Gedichten (Amst. 1798), three vols., are several hymns and odes distinguished for great elevation and feeling. His ode on Ruyter is very celebrated. He also made that naval hero the subject of an epic poem. The best of his tragedies are Thirza, Johanna Gray, and particularly Inès de Castro. In connection with Bilderdyk he gave a better form to Haren's celebrated poem De Geuzen (Les Gueux, The Beggars), the subject of which is the foundation of Dutch freedom. His poetical Letters to Sophia on Kant's Philosophy (Brieven aan Sophie over de Kantiaansche Wijsbegeerte, Amsterdam, 1805) are a feeble effort of his old age. Among his prose works, his Letters on different Subjects of Literature (six vols. 1784) are distinguished, and contributed much to the dissemination of good taste, by their finished style and excellent criticisms.

FELANITX, or FELANICHE (ancient *Canatix*), a town in the island of Majorca, in a mountain valley, 28 miles E.S.E. of Palma. It is a very ancient but well-built place, consisting of several squares and spacious streets, and has a parish church, town-house, two schools, and an hospital. On an adjoining height is an ancient Moorish castle, with subterranean vaults. Manufactures: linen and woollen goods, brandy, and ropes. Trade: rice, coffee, sugar, wine, brandy, fruit, and cattle. Pop. 9752.

FELICUDI (ancient, *Phœnicusa*), one of the Lipari Isles, off the north coast of Sicily, 10 miles west of Salina. It is about 9 miles in circuit, presents to the sea bold and rugged cliffs of basalt, and has three lofty summits, evidently produced by an extinct volcano. The soil is both fertile and well cultivated. Pop. 800.

FELIDÆ. This family, which contains the most characteristic members of the order Carnivora, contains only one genus, *Felis*, which is divided into several subgenera. The characters of the family are: the possession of a slender, extremely flexible body, of great muscular power; the limbs are five-toed, the thumb of the anterior limbs not reaching the ground; the skull is relatively short, the facial portion much shortened, very broad, and giving, by its capacious zygomatic arches, abundant space for the powerful muscles which move the lower jaw. The incisors are three in number on each side, above and below; the powerful canines are trenchant on both edges, and are sometimes grooved; the premolars are three above and two below, the molars one above and below—in all, thirty teeth. The premolars are laterally compressed, the third upper tooth, the carnassial, or sectorial premolar, having only a minute inner tubercle. All are digitigrade. The divisions, as given by Carus, are:—Subgenus 1. *Felis*. Claws retractile; limbs low; tail as long as the body. A. Old World forms. *a* Lions (*F. leo*). Colour uniform; a mane. Africa and Western Asia. *b* Tigers (*F. tigris*). No mane; body striped. Whole of Asia, from the Altai and Amoor to Java and the Caucasus. *c* Leopards (*F. pardus*). Large species, with spots or rings, and round pupils. Africa and South Asia. *d* Serval (*F. serval*). Small spotted species. South Africa. *e* Cats (*F. catus*). Small, not spotted, sometimes striped; pupils elliptic vertical. B. New World forms. *a* Leonine. Colour uniform; no mane. Puma (*F. concolor*). *b* Leopard-like. Jaguar (*F. onca*).—Subgenus 2. *Cynailurus*. Claws not quite retractile. Hair on neck and between shoulders, long, manelike. Cheetah (*F. jubata*). Africa and South Asia.—Subgenus 3. *Lynx*. With ear-tufts and short tails. A. Old World forms. Caracal (*F. caracal*) and chaus. South Asia and Africa. B. New World forms. Canadian lynx (*F. canadensis*). Red cat (*F. fasciata*). Bay lynx (*F. rufus*)—all in North America. The family was represented in tertiary times by the cave tiger (*F. spelea*); an American species (*F. protopanther*); and an Indian (*F. cristata*). *Machairodus*, with its enormous sabre-like upper canine, ranged from miocene to pleistocene times in Europe.

FELIX, ANTONIUS or CLAUDIUS, procurator of Judea and freedman of the Emperor Claudius, is described by Tacitus as unscrupulous and profligate both in his public and private conduct, and was living in adultery with Drusilla, wife of Azizus, king of Emesa, when Paul's discourse 'of righteousness, temperance, and judgment to come' (Acts xxiv. 25) made him tremble. He was recalled A.D. 62, and narrowly escaped condemnation at Rome, on charges which the Jews had lodged against him.

FELIX, MARCUS MINUCIUS, a distinguished Roman lawyer, who embraced Christianity, and wrote an excellent defence of it in a dialogue entitled Octavius. The period when he flourished is uncertain, some making it as early as the reign of Marcus Aurelius, while others make it as late as that of Diocletian. The purity of the Latin style, and some of the allusions to the existing state of the church, would seem to favour the earlier date; but it is not easy to set aside the direct testimony of Jerome, who, in a regular list of Christian writers, places him between Tertullian and Cyprian, thus fixing the period to about A.D. 230. The Octavius has been translated into most European languages.

FELLAH. See EGYPT.

FELLATAHS, FOULAHS, or FULAHS, a remarkable African race of the negro type, the original locality of which is unknown, but which is now widely diffused throughout the Sudan, where they form a kind of ruling aristocracy. The states or kingdoms of Senegal-Futa, Futa-Jalon, Haussa, Sokoto, &c., are in their hands, and they thus extend from Senegambia eastward to Lake Tchad. Though of the negro family, they differ widely in their physical characteristics from that race, having neither their deep jet colour, crisped hair, flat nose, nor thick lips. In person they are decidedly handsome, and mostly of a light copper colour; features regular and good, mouths small, European lips, and noses inclining to aquiline; hair soft and silky, well-defined black eyebrows, long eyelashes, and fine black eyes; tall, well proportioned, and of erect and graceful figure; some of the young women are very good-looking, and would be considered beautiful even in Europe. They are shrewd and intelligent; possess great influence in the districts where they reside; are extremely active, polished, and insinuating in their manners, and said to possess great bravery and perseverance. They are not very much addicted to trade or agriculture, leaving these chiefly to the subject peoples. They are mostly Mohammedans, to which religion they became converts about 400 years ago. They wear great numbers of greegrees or amulets, composed of paper of all sizes, upon which portions of the Koran are transcribed, and covered with silver, copper, or leather.

FELLENBERG, PHILIP EMANUEL VON, the founder of the institution for the improvement of education and agriculture at Hofwyl, in the canton of Berne, in Switzerland, was born in 1771. His father was a man of patrician rank, of the city of Berne, and, in consequence, a member of the government. His mother, a great-granddaughter of the celebrated Admiral Van Tromp, appears to have been distinguished no less for enlarged benevolence than for sincere piety, and to have exerted an important influence on his character and usefulness. The years 1795–98 he spent in travelling over France and Germany, visiting in preference the villages, and chiefly devoting his attention to the material, intellectual, and moral condition of the agricultural classes. He became convinced that the cause of all the existing poverty and misery was the absence of sound and rational instruction, and that the remedy lay in combining with a sound general education special training for the pupil's future trade. On his return to Berne he held for a short time an important municipal appointment, which he resigned in consequence of the illiberal policy of the government, and devoted himself to the improvement of the social and intellectual welfare of the peasantry. For this purpose he purchased the estate of Hofwyl, and established successively an institution for instructing the children of the poorer classes, a seminary for children in the higher grades of life, and a normal school. The pupils were all trained to work in the fields or at the bench, and the product of their labour was sufficient to cover the

expenses of their education. Fellenberg's scheme was at first ridiculed by his countrymen, and looked upon for a time with some suspicion by the government; but it was not long until its beneficial results attracted even the attention of foreign governments. Alexander I. of Russia conferred upon the philanthropist the decoration of St. Vladimir, and sent seven young nobles to be educated at his institution. Several foreign princes visited the establishment, and founded institutions on a similar plan. On the death of Fellenberg, in 1844, the enterprise was carried on by his son Wilhelm, but without success, and was soon entirely abandoned.

FELLOE, the circular wooden rim which, with the addition of a nave and spokes, make the wheel of a carriage.

FELLOWS, Sir Charles, traveller and antiquarian, was born in 1799, at Nottingham. Without any claims to classic attainments, he collected with his unassisted means a vast amount of material for the learned to labour upon. He first explored the valley of the Xanthus in Lycia, in 1838, and discovered the remains of the two cities Xanthus, the Lycian capital, and Teos. Under the auspices of the trustees of the British Museum he made further explorations in 1839 and 1841, and succeeded in obtaining the marbles now in the Lycian saloon of the Museum. He was knighted by the queen in 1845. He passed the latter years of his life chiefly in the pursuit of agriculture in the Isle of Wight, and died in 1860. His principal works are Travels and Researches in Asia Minor, and Coins of Ancient Lycia before the Reign of Alexander.

FELLOWSHIP, in universities, an establishment which entitles the holder, called a fellow, to a share in the revenues of certain English colleges. Fellowships vary in value from £30 to £500, and even £800 in rare cases, but a large proportion may be said to average from £150 to £300; and they confer on their holders the right to apartments in the college, and certain privileges as to commons or meals. The fellows are, in general, graduates; and were, under the old systems, elected on free competition, or according to limitations fixed in the statutes of foundation, but most of these limitations have been abolished by the University Act of 1854. New fellows are now generally elected by the head of the college to which they belong and the fellows, or by the head and certain of the fellows, after a competitive examination. Fellows are, in most cases, obliged to abandon their fellowships if they do not take orders at a certain period: there are, however, lay fellowships in both of the great universities. Fellowships are, in general, also vacated by marriage (though this disability may now be removed by a special vote of the college), and by acceptance of preferment in the church from the college, or in some instances of other preferment of a certain value. From among the resident fellows are selected, for the most part, the governing officers and tutors of the college.

FELO DE SE (Latin, a felon of himself), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. The laws have considered voluntary suicide a crime, and, as they could not reach the criminal himself, have inflicted a punishment on his friends and relatives, by ordering that his body should have an ignominious burial. But as no person of unsound mind is supposed to be capable of committing a crime, provision was made for a trial by a coroner's inquest or jury, which, being summoned for the purpose, pronounced whether the deceased killed himself, and also decided whether he was of sound mind and capable of being a *felo de se*, within the meaning of the law. As, however, the punishment in this case was strongly repugnant to the feelings of humanity, and the jurors were more disposed to compassionate the relatives of a man who had committed such an act than to inflict an additional misfortune upon them, they most frequently, and, indeed, almost uniformly, gave a verdict of insanity, so that it had become a very general sentiment that the act of deliberate suicide was itself proof of an unsound mind. Another reason for this proceeding was, that by the laws of England a *felo de se* forfeited all his personal property to the king—another punishment on his survivors which the jurors would very naturally be led, by the same sentiments of humanity, to avert. The law was accordingly, for the most part, inoperative, as well as inhuman and unjust; and, in England, the barbarous mode of burning the felon's body at four cross-ways, with a stake driven through it, was abolished by 4 Geo. IV. cap. lii.; and by 33 and 34 Vict. cap. xxiii. forfeiture of property for the offence was abolished.

FELONY, in law, includes generally all capital crimes below treason. It is a word of feudal origin, and is supposed by Spelman to have been derived from the Teutonic words *fee* and *lon* (price), and meaning the price of the fee, and accordingly was applied to those crimes which were punished by forfeiture of lands; so that the crime would, in the common expression, be as much as a man's fee was worth. This derivation of the word is, however, very doubtful. The term is now applied to some acts for which capital punishment is not inflicted; as suicide is called a *felony*, and the self-murderer a *felon*, though it is an offence for which, from the nature of the case, the felon himself could never be punished. The term is generally used, however, to signify crimes which are punished with death, or next severest penalties.

FELSPAR. This name was formerly given to the white, pink, or red mineral which is an abundant constituent of granite, gneiss, and other rocks, and which was supposed to be a distinct and independent substance. Further inquiry has proved that there are several kinds of minerals partaking of the same characters, and so the name has been transferred from the mineral to the natural family to which it belongs. The minerals comprised under this title are distinguished partly by their chemical composition, partly by their crystalline form. They all consist of silicate of aluminium combined with the silicates of calcium, sodium, or potassium; but it is seldom that analysis shows a potash felspar which does not contain soda. The felspars have been divided into the *orthoclase*, or potash-felspar group; *oligoclase*, or soda-felspar group; to which some add *anorthite*, or lime-felspar group, the different varieties being merely mixtures of the others. In the first, which includes adularia, amazon-stone, perthite, and loxoclase, the potash varies from 16 down to 4 per cent., the soda rising from nothing in adularia to 10 per cent. in loxoclase; in the second, which includes albite and oligoclase, with their varieties, the soda rises to 12 per cent., and lime takes the place of potash; in the third, in which is comprised andesin, labrador, bytownite, and anorthite, with their varieties, the lime rises from 6 per cent. to 20 in anorthite, while the soda falls from 8 per cent. in andesin to 1 per cent. in anorthite. With regard to the proportion of silica there appears to be a gradation, but whether it is as regular as some mineralogists affirm is open to question, particularly as the formulæ assigned even to the best known and most important species do not quite tally. The gradation referred to is exhibited by anorthite, containing $2\,SiO_2$, labradorite $3\,SiO_2$, andesin $4\,SiO_2$, oligoclase $5\,SiO_2$, and albite $6\,SiO_2$, in combination with 1 combining proportion of alkaline base and 1 of alumina, the lime-

felspars of course showing a doubled formula. From these characters the felspars have been further characterized as basic, or containing excess of metallic oxide, such as anorthite; and acid, or containing excess of silica, such as albite and orthoclase.

The felspars are further distinguished by their crystalline form. The potash-felspar or orthoclase belongs to the monoclinic system, the soda-felspar or oligoclase, and the lime-felspar or anorthite, to the triclinic system. The two last divisions have been included under the term *plagioclase*. All the members of this family have a specific gravity between 2·4 and 2·8; hardness 6 to 7; vitreous or pearly lustre; opaque, but sometimes translucent. They fuse with difficulty, if at all, before the blowpipe, are not dissolved by the ordinary mineral acids, but are decomposed by hydrofluoric acid, and by digestion in carbonic acid water, which removes the alkali and disintegrates the mineral, producing clay or *kaolin*. The colour varies from gray and white, through different shades of pink to red; some have an iridescent or chatoyant appearance, or are green with silvery spangles, while others are yellow and contain golden spangles.

The felspars, especially orthoclase and oligoclase, are among the most important rock-forming minerals. They occur abundantly in granites and metamorphic rocks, and in all traps and basalts. In these rocks the felspar is mingled confusedly with the other constituents, or it forms imbedded crystals. In the hollows of granite, however, where the crystals have room to develop, large crystals quite separate, except the part by which they adhere to the wall of the cavity, are met with. The mineral is used for various purposes; the finer kinds, especially adularia or *moonstone*, amazon-stone, avanturine or *sunstone*, *labrador*, being used either for jewelry or for making ornaments, while felspar is consumed in the preparation of porcelain glaze. For the properties of the more important varieties of this mineral see the separate articles.

FELTHAM, Owen, an English author, born about the beginning of the seventeenth century, descended of a respectable family in Suffolk. Little more is known of him than that he resided many years in the family of the Earl of Thomond, during which period he published a work of great merit, entitled, Resolves, Divine, Political, and Moral. This book went through twelve editions before the year 1709. His death is supposed to have taken place about the year 1678.

FELTING. The texture of modern hats, which are made of fur and wool, depends upon the process of felting, which is similar to that of fulling. The fibres of these substances are rough in one direction only, as may be perceived by passing a hair through the fingers in opposite directions. This roughness allows the fibres to glide among each other, so that when the mass is agitated the anterior extremities slide forward in advance of the body, or posterior half of the hair, and serve to entangle and contract the whole mass together. The materials commonly used for hat-making are the furs of the beaver, seal, rabbit, and other animals, and the wool of sheep. Beaver hats, however, are now little made, silk hats having taken their place. No process of felting is required in the manufacture of silk hats, and the operations are all entirely different. The outside covering of these is a silk plush. The furs of most animals are mixed with a longer kind of thin hair, which is first pulled out, after which the fur is cut off with a knife. The materials to be felted are intimately mixed together by the operation of bowing, which depends on the vibrations of an elastic string, the rapid alternations of its motion being peculiarly well adapted to remove all irregular knots and adhesions among the fibres, and to dispose them in a very light and uniform arrangement. This texture, when pressed under cloths and leather, readily unites into a mass of some firmness. This mass is dipped into a liquor containing a little sulphuric acid; and, when intended to form a hat, it is first moulded into a large conical figure, and this is afterwards reduced in its dimensions by working it for several hours with the hands. It is then formed into a flat surface, with several concentric folds, which are still further compacted in order to make the brim, and the circular part of the crown, and forced on a block, which serves as a mould for the cylindrical part. The nap, or outer portion of the fur, is raised with a fine wire brush, and the hat is subsequently dyed, and stiffened on the inside with glue. In the felt hats properly so called, now so generally worn, no nap is raised at all. An attempt has been made, and at one time excited considerable expectation in England, to form woollen cloths by the process of felting, without spinning or weaving. Perfect imitations of various cloths were produced, but they were found deficient in the firmness and durability which belongs to woven fabrics. Asphalted felt is a coarse felt saturated with pitch, asphalt, or coal-tar, and used for covering sheds and other buildings, and a superior kind called inodorous felt is used for lining damp walls of rooms previous to papering them. The felted sheathing used as a covering for retaining the heat in steam is a fabric intermediate between felt and paper, being made of the coarsest woollen refuse from paper-mills.

FELTRE (*Feltria*), a town in Northern Italy, in the province of Belluno, about 44 miles N.N.W. from Venice. There are some manufactures here of silk and leather. Feltre is the see of a bishop; it contains 5500 inhabitants.

FELUCCA, a little vessel with oars, common in the Mediterranean. See Boat.

FEME COVERT, in law, signifies a married woman, in contradistinction to a *feme sole*, or single woman. See Husband and Wife.

FEMERN, or Fehmarn (Latin, *Fimbria*, *Cimbria-parva*), an island, Prussia, duchy of Schleswig, off the north-east coast of Holstein, from which it is separated by the narrow and shallow Femersund; length, about 12 miles; breadth, 8 miles. It is very flat, and has a marshy, fertile soil. In the north and west parts are several lagoons, the waters of which in summer are nearly evaporated, and the swamps thus formed exhale pestilential vapours. On the west shore is a lighthouse. The island is divided into four parishes; its principal town is Burg. Inhabitants chiefly agriculturists and fishers. Large quantities of stockings are knitted for exportation. Pop. 8600.

FEMGERICHTE, Fehmgerichte, or Vehmgerichte (Fem-courts), criminal courts of Germany in the middle ages, which took the place of the regular administration of justice (then fallen into decay), especially in criminal cases. These courts originated, and had their chief jurisdiction in Westphalia, and their proceedings were conducted with the most profound secrecy; hence they were called *Westphalian* or *secret tribunals*. The word is derived from the Old German *fem*, punishment, and *gericht*, a court. These courts are said to have first been instituted by Charlemagne to prevent the relapse into Paganism of the Saxons who had been forcibly converted to Christianity, but no explicit account of them occurs earlier than the thirteenth century. The total want of the means of procuring justice in a regular way enabled them to obtain, especially after the fall of Henry the Lion (1182), organization and extensive authority. When the Duchy of Saxony was dissolved,

the Archbishop of Cologne received Enger and Westphalia under the name of a duchy. It may have been at that time, that, in consequence of the complete disorder in the administration of justice, these secret, or, as they styled themselves, free tribunals, came into active operation, in the place of the courts which had hitherto been held by the bishops or royal commissaries (*missi regii*). Amidst the general distractions which were then prevalent in Germany, it was not difficult for them to acquire a tremendous authority, while they might, at the same time, produce some beneficial results; and the emperors afterwards increased this authority, by availing themselves at times of the *Femgerichte* to promote their own designs, and to intimidate by their means powerful nobles. In process of time, however, they degenerated, and no longer confined themselves to law and precedent, so that the secrecy in which they enveloped themselves only served as a cloak to their criminal purposes. The great number of their members who were dispersed everywhere made it easy for them to extend their influence through all Germany. In any German state the man who had a complaint against his neighbour, which could not be sustained before the ordinary judges, betook himself to a Westphalian tribunal. These secret tribunals were most terrible in the fourteenth and fifteenth centuries. It is therefore by no means surprising that so many voices were raised against them, and that in 1461 various princes and cities of Germany, as well as the Swiss Confederates, united in a league to enable all persons to obtain justice by their means, and to prevent any from seeking it from the secret tribunals. Particular estates likewise obtained from the emperor letters of protection against the violence of the Westphalian tribunals. The emperors themselves went no further than to make some unavailing attempts to introduce improvements into the constitution of the secret tribunals. These were bold enough, however, to oppose themselves to the emperors. Their influence was not entirely destroyed until the public peace (*Landfriede*) was established in Germany, and an amended form of trial and penal judicature was introduced. The last *Femgericht* was held at Zell, in the year 1568. Beyond the limits of Westphalia there were *Femgerichte* in Lower Saxony and other German states; but they had an authority far less extensive, and their jurisdiction was confined to a limited circle.

In consequence of the secrecy in which these tribunals were enveloped, little is known of their internal organization. The chief officer, who was generally a prince or count, had the supreme direction of the court, the jurisdiction of which comprised other free tribunals. The president of the secret tribunal was called the *Freigraf* (free count; for in early times those who administered justice in the provinces in the king's name were denominated *counts*). His associates, who concurred in and executed the sentence, were called *Freischöffen*, their sessions *Freidinge*, and their place of meeting *Freistuhl* (free bench or court). The *Freischöffen*, who were appointed by the counts, were scattered through all the provinces and cities of Germany. It is computed that their number amounted to 100,000. They recognized one another by certain signs and watchwords, which were concealed from the uninitiated; and they were hence called the *Wissende* or *illuminati*. They bound themselves by a tremendous oath; for they vowed 'to support the holy Feme, and to conceal it from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on, the rain moistens, from all that is between heaven and earth.' They acknowledged the emperor as their superior, and for this reason generally made him one of their number at his coronation at Aix-la-Chapelle. Admission, according to the strict rules, could take place only in the *Red land*, that is, in Westphalia. The assemblies of the tribunal were open or secret. The former were held by day in the open air; the latter by night in a forest or in concealed and subterranean places. In these different cases the circumstances of judgment and the process of trial were different. The crimes of which the secret tribunal usurped cognizance were heresy, sorcery, rape, theft, robbery, and murder. The accusation was made by one of the *Freischöffen*, who, without further proof, declared upon oath that the accused had committed the crime. The accused was now thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling or some neighbouring place; the accuser remained unknown. If, after the third summons, the accused did not appear, he was once more cited in a solemn session of the court, which was called the secret *Acht* or *Ban*, and if still contumacious, was given over to the *Freischöffen*. The first *Freischöffe* who met him was bound to hang him not on a gibbet but on a tree, to indicate that he was put to death by one of them. If the condemned made any resistance it was lawful to put him to death in any other manner. A dagger was left by the corpse to show that it was not a murder, but a punishment inflicted by one of the *Freischöffen*. How many judicial murders were perpetrated in this manner from revenge, interested motives, or malice, may well be imagined. The *Freischöffe* who gave the condemned a hint for his escape was himself punished with death. Similar societies existed in Italy. (Sismondi's Travels in Italy, iii. p. 443.) Paul Wigand has thrown light upon this subject in his work Das Femgericht Westfalens, 1825.

FEN, a place overflowed with water, or abounding with bogs, as the bogs in Ireland, the fens in Lincolnshire, Kent, and Cambridgeshire. These fens abound in duck, teal, mallards, pike, eels, &c., and an herbage that is very nourishing to sheep and cattle. The soil of fen lands is generally black and rich to a depth of 2 or 3 feet, and as the surface water filtrates through it to the subsoil, with proper management they will produce heavy crops of grass and corn. As they seldom have any natural outlet for draining this is generally done by machinery. Till lately wind-mills were employed in England for this purpose, but steam is now frequently adopted as the moving power, as by it the farmer can lay his lands dry at the most convenient season, whereas the operation of the wind-mill is always a matter of chance.

FENCES, continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. The kind of obstacle or material varies according to the articles to be excluded, confined or separated, and the nature of the soil and situation. All fences are either live or dead, or a combination of these. Live fences are hedges, that is, rows of trees or shrubs, such as hawthorn, crab, black-thorn, holly, beech, box, &c., planted close together, and pruned on the sides. Dead fences are stone walls, structures of wood or iron, or mounds of earth, or ditches. Iron or wire fences have lately come into much use. Vast tracts of waste land in this country and of pasture in Australia have been inclosed in this manner. Strong wires are stretched on posts firmly secured in the ground at from 100 to 200 yards distance from each other; a number of lighter posts are put in at 4 to 6 yards distance; when the wires are stretched they are fixed to the smaller posts by staples if the posts are of wood, or threaded through if of iron. In England the tenant must repair and uphold the fences

sary fences, and without any special agreement the landlord may bring an action against the occupier for not doing so. By 7 and 8 Geo. IV. cap. xxix. the destruction of fences is declared to be punishable summarily with a fine of not more than £5, or in the case of a deer fence not more than £50. In Scotland the landlord is bound to put the fences in proper repair on the entry of the tenant independently of any stipulation in the lease, but the tenant must maintain them and leave them, with the exception of any tear and wear, in the state in which they were given over to him. A tenant has no claim on the landlord for such moneys as he has expended on buildings, fences, &c., unless under stipulation in the lease, such erections being considered as being made by the occupier for his own profit or advantage.

FENCING, the art of attack and defence with any weapon not a projectile, in which address and not sheer force is employed. Among the Romans the *lanistæ* (fencing-masters) were held in great esteem. They trained the gladiators and the legionaries in the use of the short sword and shield of that epoch. During the middle ages fencing as an art was neglected in consequence of the completeness of the suits of mail worn by the combatants. When, however, metal casing fell into disuse, fencing came again into vogue. The peculiar state of society in Italy in the sixteenth century rendered skill in fencing almost indispensable, and the Italians became the most expert swordsmen of that time. In Spain the art was subsequently improved, and the Italians adopted the improvement. From Italy the art travelled to France, where it was so favoured by the court and gentry that it rapidly took a fresh development, and a new school was established, which wrought in many essential particulars a radical change. The small sword having a point but no edge is the weapon which demands the highest degree of adroitness in its use for attack and defence. The fundamental principles upon which is based the defence of the person by this weapon is a peculiar application of the power of the lever, whereby the fencer who parries an attack causes the point of his adversary's blade to deviate from the direct course and throw it aside from his body by pressing or striking the *feeble* (the part near the point) of his opponent's weapon with the *forte* (part near the handle) of his own. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel, and has a button at the end in place of a point. The parries are made with the weapon itself; the upper part of the body to the right is defended by the parry called *tierce*, the upper part to the left by the *carte*, and the lower part by the *seconde*. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knees should therefore be somewhat bent when the fencer is on guard, that he may be light and elastic in his movements. Thrusts are directed solely at the body; any cut on a limb would be counted accidental rather than intentional. An attack may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot without moving the left. An *engagement* means the crossing of the blades, a *disengagement* slipping your foil under the opponent's and then pressing in the opposite direction; *riposte*, the attack without pause by a fencer who has parried; *appels*, or beats with the right foot, *battements*, or *glissades*, beating the blade against the adversary's, or short gliding movements of one weapon along another, are motions intended to confuse an enemy and give opportunity for a thrust. Fencing with the broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drill-masters there are seven cuts, with corresponding guards, and three thrusts. Cut *one* is a diagonal, downward cut at the left cheek of the adversary; cut *three* is delivered with an upward slope at the left leg, and cut *five* horizontally at the right side; cuts *two*, *four*, and *six* attack the right cheek, right side, and right leg respectively; and cut *seven* is directed vertically at the head. Guards *one* and *two* defend the upper portion of the body, the sword sloping upwards in an opposite direction to the opponent's; guards *three* and *four* protect the legs, the sword sloping downwards; guards *five* and *six* defend the sides, when the sword is held vertically, point downwards; and guard *seven* protects the head, the blade meeting the enemy's almost at a right angle. As in foil fencing, it should always be the care of the swordsman to receive the feeble of the enemy's weapon on the forte of his own.

FÉNELON, François de Salignac de la Mothe, one of the most venerable of the French clergy, the pattern of virtue in the midst of a corrupt court. He was born in 1651, at the Château Fénelon, in Périgord, of a family illustrious in church and state. A gentle disposition, united with great vivacity of mind and a feeble and delicate constitution, characterized his youth. His uncle, the Marquis of Fénelon, had him educated under his own eye at Cahors. The youth made astonishing progress, and easily mastered the most difficult studies. In his fifteenth year he preached with great applause. His uncle, fearing that success and flattery might corrupt so amiable a heart, advised his nephew to cultivate his talents in retirement. He placed him under the care of the Abbé Tronson, superior of St. Sulpice, in Paris. At the age of twenty-four Fénelon took holy orders, and performed the fatiguing duties of the parish of St. Sulpice. Harlay, archbishop of Paris, gave him the care of a society of female teachers devoted to the instruction of young Protestant converts, called the *New Catholics*, which office he discharged during three years. In this station he first displayed his powers of instruction and persuasion. The king, having heard of the success of his labours, appointed him to take charge of a mission to Saintonge for the conversion of the Huguenots, where his mild and convincing eloquence, joined to his amiable manners, met with astonishing success. It is to the honour of Fénelon that he would not accept this post except on condition that no other means should be employed than those of charity and argument. In 1681 his uncle conferred on him the priory of Carennac. Soon after he wrote his first work, Traité de l'Éducation des Filles, which was the basis of his future reputation. In 1689 Louis XIV. intrusted to him the education of his grandsons, the Dukes of Burgundy, Anjou, and Berri. Fénelon was successful in forming the mind of the young Duke of Burgundy, heir presumptive to the throne of France, and sowed the seeds of every princely virtue in his heart; but his premature death blasted the pleasing anticipations entertained respecting him. In 1694 Fénelon was created Archbishop of Cambray. A theological dispute (see Quietism) with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII., and his banishment to his diocese by Louis XIV. Fénelon submitted without the least hesitation. In this period (1694–97) was written his letter to Louis XIV., first discovered in 1825, in which he speaks bold truths to the ambitious monarch (Lettre de Fénelon à Louis XIV., avec facsimile, Renouard, Paris, 1825). From this

time he lived in his diocese, sustaining the venerable character of a Christian philosopher, and scrupulously performing his sacred duties. He died in 1715.

His works in the departments of philosophy, theology, and the belles-lettres have immortalized his name. He was familiar with the best models of ancient and modern times, and his mind was animated by a mild and gentle spirit of benevolence. His style is fluent and pleasing, pure and harmonious. His most celebrated work is Les Aventures de Télémaque, in which he endeavoured to exhibit a model for the education of a prince. It was carried off and published by a valet employed to transcribe the manuscript. On the appearance of this work Louis manifested displeasure towards Fénelon, conceiving this historical romance to be a satire on his reign, and forbade the completion of the printing. Some malicious persons pretended, what Fénelon himself never thought of, that Calypso represented Madame de Montespan, Eucharis Mademoiselle Fontanges, Antiope the Duchess of Burgundy, Protesilaus Louvois, Idomeneus the exiled King James, and Sesostris Louis XIV. It is a masterpiece of its kind, delivering the most excellent morality in pleasing language. Two years after his death his heirs published the Télémaque, complete in two volumes. Since that time there have been numerous editions. In 1819 a monument was erected by public subscription to his memory; and the 7th of January, 1826, his statue, executed by the sculptor David, was placed at Cambray. Bausset wrote the Life of Fénelon, from original papers; and Champollion-Figeac has published a collection of his letters never before printed. The Œuvres choisies de Fénelon, with his eulogy by La Harpe, and a biographical and critical notice by M. Villemain, appeared at Paris, 1825, in six vols.

FENIANS, a name usually derived from Fionn or Finn, an Irish hero of the second century, assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was regularly organized in America; and its chief council, consisting of a 'head-centre' and five other members, which had its seat at New York, soon had branches in every state of the Union; while at the same time large numbers joined the cause in Ireland. The close of the American civil war, when large numbers of trained Irish soldiers who had taken part in the war were released from service, was thought to be a convenient time for taking some decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British government, which had received timely information. The first, in September, 1865, was prevented by the seizure of the office of the Irish People, the Fenian journal published at Dublin, in which papers were found which revealed to the government the secrets of the conspiracy, and which led to the capture of the ringleaders. The second, in February, 1866, was as speedily suppressed by the suspension of the Habeas Corpus Act in Ireland. An invasion of Canada, attempted in the same year, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the United States on which they had hitherto counted. In 1867 the public mind was again alarmed by the two violent attempts made to release Fenian prisoners—the first at Manchester, and the second at Clerkenwell Prison, London. In the first instance they were successful; but in both cases the ringleaders were captured and executed. The attempted assassination of the Duke of Edinburgh at Sydney on the 12th of March, 1868, is also ascribable to a Fenian conspiracy. In 1870 and 1871 raids were again made on Canada, but they were both as ridiculous failures as the first. The former was repulsed by the Canadian Volunteers with little loss on either side; and the latter, which was directed against Manitoba, was suppressed by the United States government. Since then little has been heard of Fenianism. The most of those who were committed to prison for complicity in the conspiracy have now been amnestied, unless they were also guilty of some criminal offence, as mutiny or murder, or had made themselves conspicuous in organizing the conspiracy.

FENNEL (*Fœniculum vulgare*), a plant of the natural order Umbelliferæ, bearing umbels of small yellow flowers and finely-divided leaves. By cultivation the seeds lose their acrid properties, and acquire an agreeable flavour; they are carminative, and are frequently employed in medicine. In Italy the young sprouts are eaten as a salad, and also in soups. Fennel seed is extensively exported from France to Great Britain, and is said to be used in making gin. The oil of fennel is obtained from the seed. It is yellowish, somewhat thick, with an aromatic odour and sweet taste. It consists of an oxidized constituent identical with that contained in oil of anise, and a hydrocarbon. It is lighter than water, and solidifies with moderate diminution of temperature. Administered to rabbits in sufficiently large doses the oil produces death. From dill (*Anethum graveolens*) are prepared oil of dill and dill water. The oil is got from the bruised fruit. It has a yellow colour, hot taste, and peculiar odour.

FENTON, Elijah, an English author and poet of considerable talent as well as learning, born in 1683 at Shelton, near Newcastle in Staffordshire, died in Berkshire in 1730. After going through the usual course of education at Jesus College, Cambridge, he took his bachelor's degree with the intention of entering the church. This design was, however, rendered abortive by his political principles, and he accepted an engagement in the capacity of usher. The Earl of Orrery afterwards, through the recommendation of his friends, was induced to make him his private secretary, and to place his eldest son under his care. In this situation he became acquainted with most of the wits of the age; and Pope, whom he assisted in his Odyssey (translating the whole of the first, fourth, nineteenth, and twentieth books of that poem), in particular was much attached to him. Pope's interest was exerted in his favour, both with Craggs, the secretary, and after his death with Lady Trumbull, to whose son he was appointed tutor. Besides the translations alluded to, he published a volume of poems (1717); Mariamne, a tragedy; and the Lives of Milton and Waller, prefixed to editions of their works.

FEODOR, the name of three Russian princes.—Feodor I., son of Ivan the Terrible, reigned from 1584–98. He was a feeble prince, who allowed himself to be entirely governed by his brother-in-law, Boris Godunov. With him the Russian dynasty of Rurick became extinct.—Feodor II., son of Boris Godunov, reigned only for a short time in 1605.—Feodor III., the son of Czar Alexis, reigned from 1676–82, warred with the Poles and Turks, and, by the Peace of Buktschisarai, obtained possession of Kiev and some other towns of the Ukraine. One of the most remarkable events of his reign was his successful opposition to the claim advanced by the nobility to a heritable right to the higher offices of the state, and his causing the so-called Rasrjäd or register of the nobility to be committed to the flames.

FEODOSIA (formerly *Caffa* or *Kaffa*), a town in Russia, on the west angle of a magnificent bay in the south-east of the Crimea, in the government of Taurida. The ancient Theodosia, from which the modern Feodosia takes its name, was founded at a very early period by a colony of Greeks from Ionia, and its site was probably not far from its modern namesake. From 1266 to 1474 or 1475 this town was in the possession of the Genoese, except for a short interval about the end of the thirteenth century, when it was held by the Venetians. While in the hands of the Genoese it was the seat of an extensive commerce with the East by way of Astrakhan and the Caspian Sea, and at that time it is said to have had a population of 80,000. From the Genoese it was taken by the Turks, and after that its prosperity rapidly declined. Much has been done for it since it came into the possession of Russia, and it is still one of the most important towns in the Crimea. Pop. 9882.

FEOFFMENT, an old mode of conveying freehold estates peculiar to English law, by which the conveyance was completed by a ceremony called livery of seisin. This ceremony is performed in two ways, either by deed or by law. When it is performed by deed both the person who conveys the estate (the *feoffor*) and the person to whom it is conveyed (the *feoffee*) have to be on the estate, and the feoffor then hands to the feoffee a clod, branch, or turf belonging to the land, or in the case of a house, the knocker, ring, or latch of a door. In this case the feoffee may be represented by an attorney, who must be appointed by deed. When the livery of seisin is performed by law, the feoffor and feoffee have merely to be within sight of the estate which is conveyed, to which the feoffor points, saying to the feoffee that the livery of yonder house or property is given to him. In this case the feoffee cannot be represented by an attorney, and he must enter into possession during the lifetime of the feoffor. Formerly there was nothing more necessary to the legal conveyance of any estate than the proceedings just described; but by act 8 and 9 Vict. cap. cvi. all feoffments must now be by deed, unless such as are made under a custom by an infant. It is usual to endorse in the deed the fact of the livery of seisin, but the fact of this not being done does not invalidate the deed, as the livery of seisin may be proved by parole evidence, and equity will supply the want of it where the deed was made for good and valuable consideration. Until the passing of the act already mentioned the conveyance by feoffment of a freehold greater than the feoffor possessed was a tortious conveyance which rendered the feoffor liable to forfeit the estate of which he was seized; but this act declared that such conveyance should no longer be held as tortious, but innocent, so that in a case of this nature a conveyance is valid with reference to the estate which the feoffer can lawfully convey, but no more.

FERÆ NATURÆ ANIMALS, the name given in the Roman law to beasts and birds of a wild and untamable disposition, as contradistinguished from those which are *domitæ naturæ*, that is, tame animals, such as horses, sheep, &c. The Roman law held such animals as naturally belonging to the first person who should take possession of them, but regarded the right of possession as continuing only as long as the possessor kept them in confinement. As soon as the animal escaped it again became common property, and might be taken possession of by any other person who could capture it, unless the animal had an *animum revertendi*, that is, an intention of returning, which it was to be presumed it had, if it had been trained to return to its master's property, and was in the habit of doing so. This principle has been adopted by both English and Scotch law. When such animals as are classed as *ferœ naturœ* make nests or burrows on any person's property, and have young, the young are held as belonging to this person as long as they are unable to fly or run away. Those persons who have the right of hunting, taking, or killing those wild animals which are included under the designation of game, have a qualified property in such animals as long as they continue within his liberty, but no longer. A person who keeps an animal indisputably *ferœ naturœ* is responsible for any injury which it may do to the person or property of another. See DOG, in law.

FERDINAND, German emperors:—

1. FERDINAND I., brother of Charles V., after whose abdication in 1556 he took the title of Emperor of Germany, although his claim to the title was not recognized by the electors till 1558. In 1526 or 1527 he became king both of Hungary and Bohemia, and after that period these two kingdoms remained attached to the empire, except when in 1619 an attempt was made to hand over the crown of the latter to Frederick V., the elector palatine. Ferdinand had been chosen King of the Romans in 1531. In 1559 he held a diet at Augsburg, in which the currency of the empire was regulated, and many religious grievances suffered by the Protestants were exposed. Ferdinand was of a mild and tolerant character, and in 1562 he obtained from the Council of Trent several religious privileges for his subjects.

2. FERDINAND II. was born in 1578, and succeeded his uncle Matthias as Emperor of Germany in 1619. He was of a dark and reserved character, had been educated by the Jesuits at Ingolstadt, and in his religious views was very unlike his ancestors, Ferdinand I., Maximilian, or even Rudolph and Matthias. His zeal was excited against every deviation from the decrees of the Council of Trent, and he obstinately adhered to bigoted and narrow views of religion. The Bohemians, jealous of the privileges which they had secured from Rudolph, and of which they saw that Ferdinand was disposed to deprive them, declared that he had forfeited the Bohemian crown, which they offered to the Elector Palatine Frederick V., a step which led to the outbreak of the Thirty Years' war. As the rest of Ferdinand's reign is inseparably mixed up with the history of that war, it is enough to refer to the article on that subject for further information regarding this emperor. The support of the league, and of the Elector of Saxony, John George I., placed him firmly on the throne of Bohemia, where he relentlessly persecuted the Protestants, banishing their preachers, and compelling many thousand industrious people to remove to foreign countries. He recalled the Jesuits, and tore the chapter of privileges granted by Rudolph II. with his own hand. Ferdinand died Feb. 15, 1637, without having accomplished his most cherished design of destroying Protestantism and political freedom.

3. FERDINAND III., son of the preceding, was born in 1608, and succeeded his father in 1637. Before his accession to the throne he had served in the Thirty Years' war, and he commanded the imperialist troops at the victory of Nordlingen. From the experience which he obtained in this portion of his life of the miseries caused by the war, he was more disposed towards peace than his father, but he was nevertheless obliged to continue it for eleven years longer before the Peace of Westphalia (1648) was concluded. (See THIRTY YEARS' WAR, and WESTPHALIA, PEACE OF.) In the diet of 1653–54 some important changes were made in the administration of justice. Shortly before his death Ferdinand concluded a league with the Poles against the Swedes. Ferdinand died in 1657.

FERDINAND V., King of Arragon, who received from the pope the title of the *Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II., and was born March 10, 1453. On the 18th of October, 1469, he married Isabella of Castile, and thus brought about a close connection between Arragon and Castile, although both kingdoms continued to be governed separately, for Isabella allowed her husband no other share in the government of Castile than the privilege of affixing his signature to the decrees, and of uniting his arms with her own. With Ximenes they raised Spain to an eminence which she had never before attained. After a bloody war of ten years they conquered Granada (1491), the only kingdom of which the Moors yet retained possession in Spain; but the most brilliant event of their reign was the discovery of America, for which Isabella had furnished the ships, and which made them sovereigns of a new world. (See COLUMBUS.) This politic prince laid the foundation of the Spanish ascendency in Europe by the acquisition of Naples (1503), by means of his general, Gonsalvo of Cordova, and by the conquest of Navarre (1512); but his policy was deceitful and despotic. These stains obscure the great qualities which made him the first monarch of his time. His efforts to aggrandize himself and confirm his power, and his religious bigotry, led him into great errors. For the purpose of domineering over the consciences of his subjects he instituted the court of the Inquisition at Seville in 1480, not perceiving that he thus gave the clergy a power which they would soon use against the monarch himself. Not less unjust and impolitic was the expulsion of the Jews (1492) and the banishment of the Moors (1501). Two years after the death of his wife Isabella, which took place in 1504, he married Germaine de Foix. He died in 1516.

FERDINAND I. of Bourbon, King of the Two Sicilies (previously Ferdinand IV. of Naples), born January 12, 1751, was the third son of Charles III., king of Spain, whom he succeeded in 1759, on the throne of Naples, on the accession of the latter to that of Spain. Ferdinand IV. took the reins of government into his own hands, January 12, 1767. In 1768 he married Maria Caroline Louisa, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. Through her influence Acton was appointed prime-minister of Naples, the cabinet of which thenceforward became closely united with those of Austria and Britain, and dissociated from that of Madrid on the outbreak of the French revolution. As the cabinet of Naples hesitated to comply with the demand of France to renounce all connection with Britain, La Touche appeared with a French squadron before the capital, and compelled the court to accept the prescribed conditions. But after the death of Louis XVI. Ferdinand joined the coalition against France, and took part in the general war from 1793 to 1796. After two years of peace the victory of Nelson at Aboukir again engaged Ferdinand against the French, who, on the defeat of the Neapolitans under General Mack, took possession of the whole kingdom (January 23, 1799), and proclaimed the Parthenopean Republic—an act which the situation of affairs probably rendered necessary. The new republic did not last long. The court, which had fled to Palermo, returned to Naples in January, 1800, when a treaty was concluded between Spain and the first consul, by which the integrity of the Kingdom of the Two Sicilies was guaranteed. In 1806 Ferdinand was again driven from Naples by the French, and compelled to take refuge in Sicily, where he maintained himself by the aid of the British. Meanwhile Joseph Bonaparte, the brother of Napoleon, and Joachim Murat, one of Napoleon's generals, reigned in succession in Naples, the former from 1806 to 1808, the latter from 1808 to 1815. The Congress of Vienna finally re-established Ferdinand IV. in all his rights as King of the Two Sicilies in 1814, while Naples was still occupied by Murat. But after the flight of the latter in March, 1815, Ferdinand once more entered Naples, June 17, 1815. In 1816 he assumed the title of Ferdinand I., king of the Two Sicilies. Almost all the good regulations which Joseph and Murat had established for the promotion of agriculture, education, the civilization of the lazzaroni, &c., were abolished. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new constitution. The Austrian arms, however, enabled him to disregard his oath and solemn promises. They re-established him (after he had been obliged again to leave Naples) in the possession of absolute power in 1821. He died in January, 1825, and was succeeded by his son, Francis I.

FERDINAND II., King of the Two Sicilies, born in 1810, was the son of Francis I. by his second wife, Isabella Maria, infanta of Spain, and succeeded his father on the 8th of November, 1830. The revolution of France in this year had unsettled the minds of men throughout the Continent generally, and was felt more particularly in the two divisions of the Neapolitan Kingdom, where a despotism of the most grinding description had long existed. The new sovereign at first made some concessions to his subjects; but as soon as he felt himself strong enough he returned to the old system, and gave his subjects to understand that henceforth his will was to be their only law, and that the least opposition to it would be followed by banishment or incarceration in a dungeon. This was no empty threat. Devoting much of his time to hunting, he left the government to be administered by priests and other favourites, and reserved his interference chiefly for occasions requiring the exercise of that mixture of obstinacy and energy which formed the leading feature in his character. It was impossible that such a reign could be tranquil, and after a succession of partial outbreaks, the revolutionary year of 1848 brought matters to a crisis, during which Ferdinand II. earned the nickname of 'King Bomba,' by bombarding his capital from the forts commanding it. At the commencement of the insurrection, which first broke out at Palermo, and threatened to extend over both divisions of the kingdom, Ferdinand issued a decree promising a constitution, but ultimately, when he had by main force re-established his ascendency, he retracted all his promises and established one of the vilest despotisms which has disgraced modern times. Great Britain and France, alarmed at the consequences, endeavoured, by friendly remonstrance, to check him in his mad career, and being only rebuked for presuming to interfere, testified their displeasure by withdrawing their ministers from Naples. This measure seems only to have made Bomba more resolute than ever to rule in his own way, and he died on the 22d of May, 1859, at the age of forty-nine, leaving his dungeons crowded with the best and bravest of his subjects. The retribution which he was permitted to escape has already overtook his son, who lost his crown, which passed to Victor Emmanuel, king of Sardinia, thenceforward king of Italy.

FERDINAND III., JOSEPH JOHN BAPTIST, Grand-duke of Tuscany, Archduke of Austria, &c., born in May, 1769, succeeded his father, the Emperor Leopold II., as Grand-duke of Tuscany, July 2, 1790. This prince, whose character was at once mild and firm, governed his country in the spirit of his father. He was the first sovereign to acknowledge the French

Republic, and although he was compelled to join the first coalition against it, he took the first opportunity of withdrawing. In spite of this he was, in 1799, at the time of the second coalition, deprived of his dominions, which, at the Peace of Lunéville, in 1801, were given to the Prince of Parma. He afterwards received as compensation the Duchy of Salzburg, in Germany, with the title of elector. In 1805 he exchanged Salzburg for the Grand-duchy of Würzburg; in 1806 he joined the Confederation of the Rhine, and till 1813 remained a faithful ally of Napoleon. By the first Peace of Paris (May 30, 1814) he recovered his hereditary dominions. He died in 1824.

FERDINAND VII., King of Spain, eldest son of Charles IV., and of Maria Louisa of Parma, born in 1784; died in 1833. From the earliest years he manifested a strong dislike to the favourite Godoy (the Prince of Peace), who ruled both the king and queen; and in 1807 he was arrested as a conspirator. After the popular rising at Aranjuez, in March, 1808, his father was forced to abdicate in his favour. A month later, having been induced to meet Napoleon at Bayonne, he himself abdicated in turn, placing the crown at the disposal of Napoleon, who at once gave it to his brother Joseph. Ferdinand was kept a prisoner at Valençay till 1813, when Napoleon offered to re-establish him on his throne. He returned to Spain in March, 1814, having previously promised to maintain the constitution of 1812. In spite of his promise he annulled this constitution and dissolved the Cortes two months after his return, and in consequence of this and of the arbitrary nature of his government generally, a military insurrection broke out on the 1st of January, 1820. The rebels were at first successful, and Ferdinand was obliged to swear to the constitution of 1812; but having received support from Louis XVIII. of France, who sent an army to his aid, commanded by his nephew, the Duke of Angoulême, he was ultimately enabled to suppress the insurrection, and to make his authority once more absolute in Spain. Ferdinand was married four times, but only left one daughter, Isabella, by his fourth wife, Maria Christina of Naples. By a decree issued March 29, 1830, called the Pragmatic Sanction, he abolished the act of 1713, by which Philip V. had excluded women from the throne of Spain. He then left his crown to his daughter Isabella, to the exclusion of his brother, Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

FERENTINO (ancient, *Ferentinum*), a town in Italy, in the province of Latium, 6 miles north-west of the town of Frosinone. It belonged to the Volsci, under whom it rose to be a place of considerable importance, and it still exhibits the remains of ancient walls, built of hewn stone without mortar. It is the see of a bishop. Pop. 9096.

FERGUSON, ADAM, an eminent historical and political writer, was born in 1724, in Scotland, in the parish of Logierait, where his father was minister; died at St. Andrews in February, 1816. He was educated at Perth and St. Andrews, whence he removed to Edinburgh, to study for the ministry. He served as chaplain in the 42d Regiment of Foot, but, on the Peace of Aix-la-Chapelle, returned to Edinburgh, where, in 1757, he succeeded David Hume as keeper of the Advocates' Library, in 1759 was made professor of natural philosophy in the university, and in 1764 of moral philosophy. In 1774 he accompanied the Earl of Chesterfield on his travels. In 1778 he received the appointment of secretary to the commission sent to America in that year, to effect a reconciliation between the two countries. On his return in the following year he resumed the duties of his professorship, which he continued to perform till 1784, when he resigned his chair. The remaining years of his life he spent partly in travelling on the Continent, and, after his return, in retirement at different places in the neighbourhood of Edinburgh. Among his chief works are an Essay on Civil Society (London, 1767); Institutes of Moral Philosophy (1769); an Answer to Price on Civil Liberty (London, 1776); and a History of the Roman Republic (London, 1783). In 1792 he published his lectures in the form of a Treatise on Moral and Political Science, in two vols. 4to.

FERGUSON, JAMES, an eminent experimental philosopher, mechanist, and astronomer, was born of poor parents at Keith, in Banffshire, in 1710; died in 1776. He learned to read by hearing his father teach his elder brother, and very early discovered a peculiar taste for mechanics, by making a wooden clock, after being once shown the inside of one. As soon as his age would permit he was employed by a farmer to tend his sheep, in which situation he acquired a knowledge of the stars, and constructed a celestial globe. This extraordinary ingenuity becoming known to the neighbouring gentry, they enabled him to obtain instruction in mathematics and drawing, in which latter art his improvement was so rapid that he repaired to Edinburgh, and drew portraits in miniature, by which employment he supported himself for some years. In 1743 he repaired to London, where he was introduced to the Royal Society, and published astronomical tables and lectures. He also gave lectures in experimental philosophy, and among his hearers was George III., then Prince of Wales, who afterwards settled on him a pension of £50 a year. In 1763 he was chosen a fellow of the Royal Society, without the usual fees. He was well acquainted with astronomy, and experimental and natural philosophy; but his mathematical knowledge was very limited, and of algebra he knew little beyond the notation. His works are—Astronomical Tables and Precepts (1763); Astronomy Explained (fifth edition, 1772); Introduction to Astronomy (second edition, 1769); Tables and Tracts; Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics (fourth edition, 1772); Select Mechanical Exercises (1773); The Art of Drawing in Perspective (1775); An Introduction to Electricity (1775); Three Letters to the Rev. John Kennedy; and several papers in the Philosophical Transactions.

FERGUSONITE, a rare mineral originally brought from Greenland by Giesecké, and named after Mr. Ferguson, of Raith. It has been since found at Ytterby, in Sweden. It has a brownish-black colour, with metallic lustre; is translucent, but in larger crystals is opaque. Specific gravity of the Greenland variety, 5·8; of the Swedish, 5·56. Opinions of chemists as to its true constitution have varied, it having been described at one time as a columbate (niobiate), and at others as a tantalate of yttrium, with varying amounts of other very rare elements.

FERGUSSON, ROBERT, a Scottish poet of distinguished merit, was born at Edinburgh, October 17, 1750. He spent six years at the schools of Edinburgh and Dundee, and afterwards studied at the Metropolitan University and at St. Andrews. He was at one time destined for the Kirk of Scotland; but he relinquished his prospects of ecclesiastical preferment, and became clerk to a writer to the signet. He wrote poems both in pure English and in the Scottish dialect. His poems are the careless effusions of an irregular, though amiable young man, who died in early youth. His conversational talents rendered his society highly attractive—an accomplishment which proved detrimental to the poet. The excesses into which he was led impaired his feeble

constitution, and brought on disease, which terminated his existence October 16, 1774. He was buried in the Canongate Churchyard, Edinburgh, where Burns erected a monument to the memory of this kindred genius. His poems have been often printed.

FERINO, PIERRE MARIE BARTHÉLEMY, COUNT OF, a French general, born at Caravaggio in Lombardy in 1747; died at Paris, June 28, 1816. He was the son of an inferior officer belonging to the Austrian regiment of Bender. Having himself entered the Austrian army, he served in the Seven Years' war, and gradually rose to the rank of captain; but being unjustly treated by the Austrian government, he came to France in 1789, and on the 1st of August, 1792, he there obtained the rank of lieutenant-colonel, and afterwards in succession that of general of brigade (December, 1792), and that of general of division (August, 1793). He was deposed for maintaining discipline with too much severity; but was soon afterwards restored to his command, and being ordered to join the army of the Rhine and Moselle under Moreau, he took an active and distinguished part in the successes won at Landau and Bregentz, on the Lake of Constance, and in the Bavarian retreat. The courage which he displayed at the defence of the bridge of Huningen, and the combats which followed, procured for him the rank of grand-officer of the Legion of Honour (June 14, 1804) as well as the title of senator (February, 1805). Two years afterwards (1807) he received from Napoleon the rank of senator at Florence, and subsequently the government of the town and port of Antwerp. In 1808 he was made a count. Having voted for the deposition of Napoleon, Ferino received from Louis XVIII. the cross of St. Louis as well as letters of naturalization, which in consequence of the separation of Lombardy from France had become necessary in order to entitle him to sit in the new chamber of peers. The name of this general is written on the east side of the triumphal *Arc de l'étoile*.

FERISHTA, more properly Mohammed Kasim, an esteemed Persian writer, who lived in India towards the end of the sixteenth and the beginning of the seventeenth century, was a native of Asterabad on the Caspian Sea, and in his twelfth year set out for India with his father, who took up his residence in the Deccan, and was for some time employed as the tutor of a native prince. In 1589, having obtained court patronage, Ferishta formed the plan of a History of the Mohammedan Power in India. He used great diligence in collecting materials, and lived to complete the work, which continues to be the best yet written on the period which it embraces. The text of this work was published in a fine edition by Major-general John Briggs, assisted by Munshi Mir Kheirat Ali Khan Mushtak, of Akberabad, under the title of Tarikhi-Ferishta, or History and Rise of the Mohammedan Power in India till the Year A.D. 1612 (Bombay, 1831). A translation of the first two books of this work, by Colonel Dow, appeared in 1770, under the title of a History of Hindustan; but a much more perfect and complete one, by Briggs, was published in London in 1829.

FERMANAGH, an inland county in Ireland, in the province of Ulster, surrounded by the counties of Donegal, Tyrone, Monaghan, Cavan, and Leitrim; area, 714 square miles, or 457,195 acres, of which 289,228 are arable, 114,847 uncultivated, 6155 in plantations, 210 in towns, and 46,755 under water. The county is divided lengthways into two nearly equal portions by Lough Erne. The country generally exhibits a succession of abrupt eminences of slight elevation, but is mountainous towards its western boundary, the highest summit here, called Cuilcagh, on the borders of the county Cavan, attaining an altitude of 2188 feet. Few of the other elevations exceed 1000 feet. The soil is variable, and not remarkably fertile. Oats, barley, wheat, flax, and potatoes are the principal crops. Considerable numbers of cattle are bred on the high grounds. Most of the farms are under 10 acres. This county is better wooded than most others in Ireland. The chief timber grown consists of oak, ash, elm, beech, and fir. Coal and iron ore are found in small quantities, limestone in abundance. Manufactures unimportant, consisting chiefly of coarse linen for domestic use. The county is divided into eight baronies —Clanawley, Clankelly, Coole, Knockninny, Lurg, Magheraboy, Magherastephena, and Tyrkennedy. Principal town, Enniskillen. It returns three members to the House of Commons, two for the county and one for the borough of Enniskillen. Pop. (1841), 156,481; (1871), 92,688.

FERMAT, PIERRE DE, one of the greatest masters of the higher mathematics, born near Montauban in 1601; died at Toulouse, January 12, 1665. He was engaged in his youth with his friend Pascal in very profound investigations as to figured numbers, on which he afterwards founded his calculation of probabilities, of which he may be considered the inventor. He also devoted particular attention to the general theory of numbers, and made many important discoveries in regard to it, far outstripping any of his predecessors; he squared the parabola in a much simpler way than Archimedes had done, and contributed greatly to the progress of geometry. His method of finding the greatest and least ordinates of curve lines is closely analogous to the method of the differential calculus, then unknown. His talents were not merely mathematical; he was well acquainted both with ancient and modern languages, and possessed a very extensive general knowledge. He carried on a keen controversy with Descartes, whose Geometry and Optics were at variance with his Theoria de Maximis et Minimis. Letters of his, written in 1636, prove that he was acquainted with the method of representing curves by equations before the publication of the Geometry of Descartes, hence M. Libri has declared that he shares with Descartes the honour of having invented the mode of applying algebra to geometry. His collected works were published after his death, under the title of Varia Opera Mathematica (two vols., Paris, 1679).

FERMENT. Certain substances which, under particular conditions, excite a molecular movement in bodies known as fermentescible, are called by the name of ferments. They are of two kinds, chemical and organic. The former, which are definite chemical compounds, are animal or vegetable products; they develop during the life of the animal or vegetable, and produce instantaneously the phenomena of fermentation at temperatures under which the manifestation of life is impossible. They do not reproduce their own species. In this group are ranged myrosine, synaptase, diastase, pectase. The latter are infusoria; they develop after the death of the vegetable or animal, and can only produce their phenomena at a certain temperature. The most favourable temperature is from 20° to 40° C. (68° to 104° Fahr.) At 0° and 100° (32° and 212° Fahr.) not only are the corresponding fermentations not produced, but they are arrested if begun. The phenomena occasioned by these ferments never appear instantaneously, there being always a preliminary period of inactivity and preparation. These ferments reproduce their own species, and multiply in large numbers. If the infusoria are killed the fermentation ceases at once. According to M. Pasteur, every fermentation has its particular ferment or infusorial organisms. See FERMENTATION.

FERMENTATION. There are several kinds of fermentation:—1st, the *vinous* or *alcoholic* fermentation, in which liquids change from saccharine to alcoholic by the disengagement of carbonic acid; 2d, the *acid* fermentation, in which spirituous liquors become acid, producing acetic acid; 3d, the *putrid* fermentation, which takes place for the most part in organic substances, which become gradually converted into mould, during which process they undergo various alterations according to the nature of the substance, and generally set free poisonous gases. Fermentation is also described as lactic, butyric, glucosic, viscous, colouring, panary, &c., according to the nature of the results. Yeast obtained from beer, which forms one of the most active ferments, and which has the appearance of a firm paste, of a grayish white colour, and a peculiar rather sharp smell, is obtained by skimming off the froth which forms itself on the surface of the worts during the fermentation of malt. This is an instance of the vinous or alcoholic fermentation. Gay-Lussac had observed and, according to his own view, established that the fermentation of the must or juice of the grape could not take place without the direct intervention of the air. He showed that if grapes were crushed in two test-vessels filled with mercury, into one of which air is admitted while it is excluded from the other, the former will give indications of fermentation by the disengagement of carbonic acid, while the juice in the other will remain entirely unaltered. From this experiment it had been concluded that under the influence of a small quantity of oxygen the albumenoid principle of the grapes underwent some modification by which it was made a ferment, which converted the sugar into alcohol and carbonic acid. It was generally believed that, as Liebig had maintained, the action of the ferment on the sugar was not the result of mere contact, a case of a simple communication of motion. Some chemists and natural philosophers, among them Berzelius, supposed that the nitrogenized matter acts like oxide of silver, which decomposes oxygenated water without depriving it of anything and without adding anything to it. Berzelius held in addition that yeast is a chemical product which is precipitated during the fermentation of beer, and takes the globular form of non-crystalline precipitates. The experiments of M. Cagniard de Latour and some other men of science had demonstrated that yeast was an organic substance, without however establishing that it acted in any other way than nitrogenized dead substances when brought into contact with a fermentescible substance.

A liquid, in order to undergo the alcoholic fermentation, must fulfil four essential conditions: 1. It must contain dissolved sugar or glucose, or substances which can be converted into one or other of these two. 2. The solution must be sufficiently diluted with water. 3. The temperature must be between 10° and 30° C. or 50° and 86° Fahr. 4. The liquid must be brought into contact with a ferment in order that the process may be commenced. When the juice is expressed from some saccharine plant and allowed to stand in a vessel with a loose-fitting cover over it, and at a temperature of from 20° to 24° C. or 68° to 75° Fahr., it acquires after the lapse of some hours a bluish colour and a milky appearance, while there is a slight disengagement of gas, which increases as the liquid assumes a more turbid aspect. The liquid then begins to effervesce, and continues in this state for some time. Its temperature at the same time rises to a higher point than that of the surrounding air. The bubbles of gas which proceed from the matter which is precipitated become attached to it, and raise it along with themselves to the surface of the liquid, which is thus covered with a supernatant precipitate, the particles of which, as they become disengaged from the bubbles of gas sustaining them, fall to the bottom, where they develop new bubbles of gas. These again recommence and continue the same movement as before during a space of time, which varies according to the temperature, the quantity, and the kind of sugar contained in the liquid, the efficacy of the ferment, and other circumstances. When the disengagement of gas has ceased, the precipitate falls to the bottom of the vessel, and the liquid, now entirely deprived of sugar, is one of the products of fermentation.

From the interesting labours of M. Pasteur on this phenomenon, one of the most important and remarkable in creation, and which is connected with both chemistry and physiology, we conclude that azotized organic substances are not ferments; in their contact with fermentescible substances, whatever change may have been due to the atmosphere, they cannot become so. They are merely the aliment of ferment, which is a mycodermic vegetable, whose germ is in the air or in the adjacent substances, and which is developed and multiplied *ad infinitum* so long as there is fermentable matter; it is correlatively to the development of that organism that there is fermentation. Thus when sugar is brought into contact with gluten, casein, or animal membrane, the ferment is not the nitrogenized matter, but a microscopic vegetable, of which the germ is originally brought by the air, and which forthwith multiplies, borrowing at the same time its carbon from the sugar, its nitrogen and its phosphates from the gluten or the cascin. This is the process in the case of alcoholic fermentation, by the barm of beer; and although the organic nature of the latter, together with its mycodermic vegetable character, is an exception and awkward anomaly so far as the theory is concerned, it is by these properties that that matter is included in the class of ferments. The mycoderms are the little cryptogams which rise to the surface of fermented liquors in the shape of pellicles or flakes, which are ordinarily called flowers of wine, flowers of vinegar, &c.

To prove that ferments were organized, and that their production has no necessary connection with albumenoid matter, M. Pasteur suppressed the latter in the fermentation, and substituted for it phosphates and crystallized sal ammoniac. To sugar-candy dissolved in water he added these substances, with or without carbonate of lime destined to neutralize the acids; the fermentation took place as quickly as if he had employed gluten or casein, and he saw the same vegetable bodies depositing themselves and multiplying just as they do when this phenomenon takes place under ordinary conditions. But after having established that the azotized albumenoid substances were not, properly speaking, the agents of fermentation, the part the air played had yet to be decided. 'Since I discovered organic ferments,' says M. Pasteur (Comptes rendus de l'Académie des Sciences, 1860), 'one of two things necessarily followed: either that these organic ferments arose from the mere contact of oxygen acting on the albumenoid matters, which would have been a case of spontaneous generation; or that the action of the oxygen from the first had no other effect than that of serving as the vehicle of the *vegetable ferment*, or of exciting its germination. The examination of the doctrine of spontaneous generation thus presented itself as an incidental study, forced upon me in my researches on the subject of organic ferments.'

By a very ingenious method, which consists in causing the air to pass through a tube, in which is inserted a stopper of gun-cotton, dissolving the gun-cotton in a mixture of alcohol and ether, and collecting on a watch-glass the particles which are freed

from the liquid partly by decantation and partly by evaporation, M. Pasteur has been enabled to show, with the aid of a microscope and certain reagents, 'that the air contains at all times of the year organic particles, except in places where the atmosphere is very calm, as for example in the cellars of the Observatory, where the temperature remains constant.' He has also established that the primary condition necessary for the appearance of living creatures in infusions or in fermentescible liquids does not consist essentially in the external air, but that local and variable causes must also be taken into account. The fine dust which is disseminated through the air contains many spores of fungi visible by means of a microscope, which readily germinate in suitable liquids, but which are rendered abortive by being previously subjected to a temperature of from 125° to 130° C., or from 257° to 268° F.

In observing the phenomena accompanying the lactic fermentation, in which lactic acid, flocculent matter, mannite, butyric acid, alcohol, carbonic acid gas, and hydrogen appear simultaneously or successively, M. Pasteur was led to recognize that the vegetable ferment which transforms sugar into lactic acid is different from those which determine the production of the flocky matter, and, besides, that these different vegetable ferments, if they are really pure, can never give rise to butyric acid. He thinks, therefore, that there must be in the latter case a butyric ferment proper. 'Frequently-repeated trials,' he adds, 'have convinced me that the transformation of the sugar, the mannite, and the lactic acid into butyric acid is due exclusively to animalcules having the appearance of minute cylindrical rings, of a mean breadth of 0·002 millimètre, isolated or connected by chains of two or more pieces, varying from 0·002 millimètre to 0·02 millimètre in length. These animalcules, which are of the nature of vibrios, live and multiply to an immense extent, without requiring to be furnished with the smallest quantity of air or free oxygen. Not only do they live without air, but air kills them. This is the first instance known of the existence of animal ferments, and also of animals living without free oxygen gas.'

From these data, and from other investigations, M. Pasteur concluded that putrefaction is determined by organic ferments of the vibrio class existing without free oxygen, but which are associated with infusoria or with mucors (fungous growths), which consume the free oxygen, and fulfil the double office of agents of combustion with regard to the organic matter, and of preservative agents so far as regards the infusorial ferments, by keeping them from the direct action of the air. 'But,' he asks, 'have not the organisms which can live entirely apart from the influence of free oxygen gas, the power of entering upon the mode of life belonging to the others, and *vice versâ*?' Such is the difficult question which M. Pasteur asks himself, and which he proposes to solve. On the whole the investigations of this talented observer on fermentation compel us to admit that this phenomenon is due to the intervention of the germs of organisms, which, under favourable conditions, are produced and multiplied with great rapidity, performing at the same time the office of agents of combustion with regard to the fermentescible substance with which they happen to be in contact. What does away with the idea of the necessary intervention of the air—a theory which was brought into vogue by the experiment of Gay-Lussac—is the fact that this fluid, when previously raised to a sufficient temperature, does not produce any effect, doubtless because the germ is destroyed by the heat, or else because the air acts or does not act according to the matters which it holds in suspension.

FERMENTED LIQUORS, alcoholic beverages obtained by the fermentation and clarification of saccharine fluids. Such liquors have been in use as drinks in all countries from the earliest times. The commonest kinds of fermented liquors are *wines*, made from the juice of the grape, and all kinds of *ale* or *beer*, made from an infusion of malt. *Cider* is a fermented liquor made from apples; *perry*, from pears; *mead*, from honey; *slivovitza*, made in Hungary and Slavonia from plums and damsons; *hasheesh*, made in Africa and Arabia from a kind of hemp; *kumys*, made by the Kirghiz from mares' milk; *chica*, from maize, by the South American Indians; *guarapo*, another South American drink, made from the juice of the sugar-cane: *pulque*, by the Mexicans, from the flower-stalk of the American aloe (*Agave Americana*); and *palm-wine* is a fermented liquor made from the pith of some kinds of palms. From all fermented liquors a spirit may be extracted by distillation.

FERMENT OILS, oils obtained by macerating plants and allowing them to ferment in water, distilling the watery fluid, and extracting the oil with ether. Many plants have been treated in this way; for example, hemlock, plantain, heath, celandine, centaury, horehound, oak leaves, willow leaves, nettle, &c. The oils are all volatile, generally with strong odour and taste; soluble in alcohol, ether, and oils, and to some extent in water. The proximate composition of these oils is unknown, but they are quite different from the oils naturally contained in plants, and obtained from them by expression or extraction with a solvent.

FERMIN, PHILIPPE, a Dutch naturalist and traveller, born at Maastricht about 1720 or 1730; died there about 1790. After having practised for several years as a physician in his native country, he emigrated to Surinam (Dutch Guiana). He remained here till about 1764, when he returned to Amsterdam. His frequent intercourse with various native tribes, and his personal acquaintance with natural history, had enabled him to make numerous and interesting observations, which he communicated to the world in several works, which are still held in esteem. Among them are, Traité des Maladies les plus fréquentes à Surinam, &c., followed by a Dissertation sur le fameux crapaud de Surinam, nommé *Pipa* (1764); Histoire naturelle de la Hollande équinoxiale ou de Surinam; Instructions importantes au Peuple sur les Maladies chroniques, pour faire suite à l'avis de Tissot sur les Maladies aiguës (Paris, 1768); Description générale, historique, géographique et physique de la Colonie de Surinam; a new edition, with figures and a topographical chart as well as numerous additions, of the Histoire naturelle de la Hollande équinoxiale (Amsterdam, 1769). This work, one of the best on the subject of Surinam, is nevertheless very inaccurate in its topographical descriptions. It was translated into German by F. H. W. Martini (Berlin, 1775). He is also the author of a defence of slavery, entitled Dissertation sur la Question s'il est permis d'avoir des Esclaves en sa possession (Maastricht, 1778), and of a Tableau historique et politique de l'état ancien et actuel de la Colonie de Surinam (Maastricht, 1778).

FERMO (ancient, *Firmum Picenum*), a town in Italy, in the province of Ascoli, on a height, 32 miles S.S.E. of Ancona. It was founded by the Sabines before Rome existed; is surrounded with old walls and a fosse, and has a cathedral, several other churches and convents, a palace, and two collections of statuary and paintings. Its harbour, called Porto di Fermo, is situated on the Adriatic, about 4 miles distant. It exports grain, silk, and woollen cloth. Pop. 8011.

FERMOY, a town in Ireland, in the county Cork, and 18 miles N.N.E. of the town of Cork, on the Blackwater, here crossed by a magnificent bridge, erected in 1866. It is generally well-built. On the left bank of the river opposite to the town are infantry and cavalry barracks, with accommodation for about 3000 men. There are here Fermoy College, St. Colman's Roman Catholic College, two convents, and a handsome Roman Catholic cathedral. It has some large flour-mills and a brewery. Pop. in 1871, 7611.

FERNANDO DE NORONHA, an island in the Atlantic, full of mountains, which have the appearance of volcanoes, but are covered with verdure. It belongs to a small group of same name, about 210 miles from the coast of Brazil; lon. 32° 38′ W.; lat. 3° 50′ S. It is defended with forts. Viewed from the sea its most conspicuous object is a barren conical peak, about 1000 feet high. It is a place of banishment for male criminals; no females are permitted to visit the island. The garrison, consisting of about 120 men, is relieved yearly. The name also applies to the whole group of which this large island is one.

FERNANDO PO, an island in the Bight of Biafra, off the west coast of Africa, about 20 miles from the mainland, between lat. 3° 12′ and 3° 47′ N.; and lon. 8° 26′ and 8° 57′ E. It is of volcanic origin, and is of an oblong form, broadest at the south extremity, 35 miles long, and 22 miles broad. A ridge of mountains traverses two-thirds of its length, south to north, terminating in a magnificent cone, 11,040 feet high, called Clarence Peak, the summit of which is almost constantly enveloped in clouds. The whole appearance of this beautiful island is picturesque in the extreme, being covered to its highest elevations, on the north part, with dense forests and luxuriant vegetation, while on the south some fine park scenery compensates a comparative deficiency of trees. The latter consist chiefly of palms and the magnificent bombax, or silk-cotton tree, 'looking in the distance,' says Captain Allen, 'so like the white sails of vessels, hull down, that one might almost have supposed they saw a numerous fleet with canvas loosened to dry.' Many of these giants of the African forests measure 150 feet from the base to the first branch, and have, in the dry seasons, festoons of beautiful climbing plants pendant from the branches. The natives of Fernando Po, called Bubis, and by themselves Edeeyahs, are a peculiar race, and wholly different in their physical characteristics and language from their neighbours on the continent. Their appearance is by no means prepossessing at first, but, on further acquaintance, they are found to be a singularly amiable people, generous, hospitable, and of the most humane and kindly dispositions, brave, yet forbearing, and reluctant to spill the blood even of an enemy. There are several harbours in the island, the most spacious of which is Maidstone Bay, at the north-east end, where, in a creek or cove, is situated Clarence Town, where a settlement was established by the English in 1827. The island was first settled by the Portuguese, who, in 1778, ceded it to Spain. The settlement made in 1827 by the English, with the permission of the Spaniards, was afterwards abandoned, and since 1844 the island has remained in the undisputed possession of Spain. The pop. of Clarence Town is about 900.

FERNEX, or FERNEY, a frontier town in France, in the department of Ain, 6 miles south-east of Gex, 1½ mile north of Geneva, in a beautiful locality, at the foot of the Jura, in a picturesque and fertile country. It is small, and its only manufactures are a few watches and some pottery. It is chiefly noted for having been the chief residence of Voltaire (who in fact founded it) from about 1760 to 1778, when he quitted it a few months before his death. The house in which he lived is still standing, and the church, with the inscription, '*Deo erexit Voltaire*,' is now a farmhouse. Pop. 1288.

FERNS (*Filices*), a natural order of the cryptogamous or flowerless division of plants, and forming the highest group of the acrogens or summit-growers. They are leafy plants, the leaves, or more properly fronds, arising from a rhizome or rootstock, or from a hollow arborescent trunk, and being circinate in vernation, a term descriptive of the manner in which the fronds are rolled up before they are developed in spring, having then the appearance of a bishop's crosier. On the veins of their lower surface, or their margins, the fronds bear small vessels named sporangia, containing spores. These spore-cases are arranged in clusters, named *sori*, which are either naked or covered with a layer of the epidermis, which forms an involucre or indusium. When the spores germinate they produce a cellular structure of a leafy description, called the *pro-embryo*, or *prothallus*, upon which are developed organs which have received the names of *antheridia* and *pistillidia*, from their being considered to represent stamens and pistils, the organs of reproduction in flowering plants. When produced upon the *prothallus*, these organs do not immediately give origin to a germinating spore; but from their mutual action proceeds a distinct cellular body, destined at a later period to develop into a fruit-bearing frond. This process, which is common alike to the production of ferns, horse-tails, club-mosses, pepperworts, mosses, and liverworts, is regarded as analogous to what has been termed the alternation of generations in some of the lower tribes of animals, as in the case of the Acalephæ or Medusæ.

Ferns have a wide geographical range. They abound in tropical islands, and generally affect a moist insular climate. The herbaceous and shrubby kind are found towards the north and south poles. The tree-ferns rival the palms in the tropical forests, having trunks which sometimes rise to a height of 50 or 60 feet. Ferns constitute, along with lycopods, the characteristic flora of New Zealand. The species of ferns, exclusive of varieties, in the Northern United States, amount to fifty-seven. The species in Great Britain, exclusive of varieties, number 41. British ferns are all comprised in the order *Polypodiaceæ*, and consist of the following genera: viz. 1, *Polypodium*, polypody; 2, *Allosorus*, rock-brakes; 3, *Gymnogramma;* 4, *Polystichum*, shield-fern; 5, *Lastræa*, buckler-fern; 6, *Athyrium*, lady-fern; 7, *Asplenium*, spleenwort; 8, *Scolopendrium*, hart's-tongue fern; 9, *Ceterach*, scaly fern; 10, *Blechnum*, hard-fern; 11, *Pteris*, bracken; 12, *Adiantum*, maiden-hair fern; 13, *Cystopteris*, bladder-fern; 14, *Woodsia;* 15, *Trichomanes*, bristle-fern; 16, *Hymenophyllum*, film-fern; 17, *Osmunda*, royal fern; 18, *Botrychium*, moonwort; 19, *Ophioglossum*, adder's-tongue fern.

The uses of ferns bear a small proportion to their number in the vegetable kingdom. Several of them yield starch, and are employed as food. *Pteris esculenta* is the edible bracken of New Zealand. The *Adiantum capillus Veneris*, the true maiden-hair fern, is said to yield an astringent and aromatic secretion. Some of the American polypodies are esteemed for their medicinal properties.

FERONIA, one of the most ancient Italian goddesses, who presided over woods and orchards. The ancient grove, not far from Anxur (Terracina), was consecrated to her, and is very celebrated. Emancipated slaves received a cap in her temple as a badge of freedom.

FERRARA, formerly a seignory, and after 1741 a duchy of Italy. It was held by the House of Este

as a Papal fief till 1597. (See Este.) In 1598 it was taken possession of by Clement VIII. as a vacant fief. In 1796 it was made part of the Cispadane, and in 1797 part of the Cisalpine Republic, and in 1802 it was included in the department of the Lower Po, in the Republic of Italy. In 1805 it formed part of the Kingdom of Italy, and in 1814 returned to the popes, with the exception of a strip to the north of the Po, which was assigned by the Vienna Congress to Austria, along with the right of maintaining garrisons in the towns of Ferrara and Comacchio. In 1860 it became, with the rest of Romagna, part of the present Kingdom of Italy, in which it now gives name to a province.

FERRARA, a celebrated city in the Kingdom of Italy, capital of the province of the same name, 26 miles N.N.E. Bologna, in a fertile but unhealthy plain, at a short distance from the north branch of the Po. It is a large and well-built town, with spacious and regular streets, and is inclosed by a wall 7 miles in circuit. It is defended on the west side by a citadel regularly fortified. In the middle of the city is a castle, flanked with towers, and surrounded by wet ditches, which was once the residence of the dukes, and is now that of the legate. Ferrara, though still retaining many traces of its former grandeur, has long been falling into decay; its pavements are overgrown with grass, and the staircases and balconies of many of its noble palaces are overrun with ivy, while others are without either doors or windows. The population has also fallen to one-fourth of its former amount. It has a cathedral and numerous churches, most of which contain valuable paintings, together with some interesting specimens of sculpture. There are here a public gallery of paintings, called the Palazzo del Magistrato, containing many excellent works by the leading painters of the Ferrara school; a school of medicine and jurisprudence, and a public library, containing about 100,000 volumes and 900 MSS., the latter including some of those of Ariosto and Tasso. The house in which Ariosto was educated, and that in which he lived during his latter years, and known by the names respectively of the Casa degli Ariosti and the Casa d'Ariosto, are shown to strangers. The latter is now national property, and is ranked among the national monuments. Another object of interest is the cell in the Hospital of St. Anna, in which Tasso was imprisoned. The house occupied by Guarini the author of the Pastor Fido—the Casa Guarina—is still inhabited by the marquises of that name. Ferrara is an archbishopric; the bishopric dates from 661; its archbishopric was founded by Clement XII. in 1735. It carries on some trade in corn and other produce of the soil. There are manufactures of silk ribbons, wax candles, and brazen utensils; tanneries and glass-works. Pop. of commune, 72,447; of town proper, about 30,000.

FERREIRA, Antonio, one of the classic poets of Portugal, was born at Lisbon, 1528. He carried to perfection the elegiac and epistolary style already attempted with success by Sá de Miranda, and added to Portuguese poetry the epithalamium, the epigram, ode, and tragedy. His Ines de Castro is the second regular tragedy that appeared after the revival of letters in Europe. It was preceded only by Trissino's Sofonisba. It is still considered by the Portuguese as one of the finest monuments of their literature, for its deep pathos and the perfection of its style. The works of Ferreira are not numerous, as his judicial office left him little leisure. He died 1569. His Poemas Lusitanos appeared complete at Lisbon, first in 1598, 4to, and Todas as Obras de Ferreira at Lisbon in 1771, two volumes.

FERRET (*Mustela furo*, Linn.) This little animal is admitted by some naturalists as a distinct species; others, following Cuvier, regard it as only an albino variety of the common pole-cat (*M. putorius*). It is distinguished by having a sharp nose, red and fiery eyes, and round ears. The colour of its whole body is a pale yellow, somewhat resembling that of box-wood. It is a native of Barbary, though it is extensively naturalized in Spain, where it was introduced to rid that country from the multitudes of rabbits with which it was overrun. Its habits are similar to those of the other species of weasels. It is lively and active, and an inveterate destroyer of rabbits. If a dead rabbit be presented for the first time to a young ferret he will fly at it and bite it with great fury; but if it be alive he will seize it by the throat and suck its blood. Great numbers of these animals are imported into England and France for the purpose of driving rabbits from their burrows. In such cases they are muzzled, otherwise they would destroy the rabbits in their holes. They suck the blood of their prey, but seldom tear it. The ferret breeds in the last-mentioned countries, bringing forth from five to nine young; but it is apt to degenerate and loses its savage nature. The warreners in England use a crossed breed between this animal and the pole-cat. This hybrid is of a darker colour than the ferret.

FERRIER, James Frederick, a distinguished Scotch metaphysician, born at Edinburgh in 1808; died at St. Andrews, June 11, 1864. He was educated at the Universities of Edinburgh and Oxford, after completing his course at the latter of which he entered upon the study of law, and was admitted a member of the Scottish bar in 1832. Finding literature a more congenial pursuit than that of law, he now began to contribute articles to Blackwood's Magazine, then at the height of its fame. The ability displayed in these contributions was so marked that when the chair of moral philosophy at the University of St. Andrews fell vacant in 1845, he was appointed to fill it. This post he continued to occupy for the rest of his life, although he was twice a candidate for a chair at Edinburgh. His chief work is entitled the Institutes of Metaphysic, in which he attempts to build up, according to a rigorously logical and deductive method, a complete system of knowing and being. The lectures he delivered at St. Andrews upon Greek philosophy were published posthumously in 1866.

FERRIER, Susan Edmonston, a distinguished novelist, the aunt of the preceding, was born in Edinburgh in 1782. Her father was a writer to the signet, and at a later period a colleague of Sir Walter Scott as one of the clerks of session. Her life was chiefly spent in her native town, in the refined and literary society of which her tastes and abilities were trained. In 1818 she made her first appearance as an authoress by the publication of the novel of Marriage, which acquired great popularity, and is alluded to in the most commendatory manner by Sir Walter Scott at the end of the Legend of Montrose. The Inheritance appeared in 1824; and Destiny, or the Chief's Daughter, in 1831. These comprise all her works, but the comparative smallness of their number is amply compensated by their intrinsic merits. No one has succeeded better than Miss Ferrier in depicting the manners of the upper middle class in Scotland at a time when the national peculiarities were still in a great measure intact, and had not as yet blended themselves into the social system of England. The management of her plots is conducted with great skill, so as to maintain an unflagging interest in the fate of the personages of the story; and the humorous powers with which many of the scenes are hit off, more especially in Marriage, remind the reader of some of Fielding and Smollett's most facetious de-

scriptions, without their grossnesses. In Sir Walter Scott's later days she was a frequent visitor at Abbotsford, where, by her sprightliness and conversational talents, she contributed greatly to cheer and enliven the depressed spirits of her host. She died at Edinburgh in November, 1854.

FERRO, or HIERRO, the most south-western and smallest of the Canary Islands; lon. of western extremity, 18° 9′. It is about 18 miles long and 9 miles broad. Good wine and brandy are made, and a considerable portion of both exported to Teneriffe. This island having once been supposed the most western point of the Old World, was formerly employed by all geographers as their first meridian, and the longitude reckoned from it, as it still is sometimes in certain countries.

FERROCYANIC ACID. See PRUSSIC ACID.

FERROL, a town in Spain, in Galicia, in the province and about 12 miles N.E. of the town of Coruña, advantageously situated on the north side of a fine inland bay, connected with the sea by a narrow channel of same name. The bay forms one of the best natural harbours in Europe, and the channel which leads to it is so completely defended by strong batteries on both its sides as to present formidable obstacles to any hostile attack by sea. The town is also strongly walled, and is divided into Old Ferrol, the New Town or Centro, and Esteiro; of which by far the finest portion is the New Town, sometimes called Centro, from its standing in the middle between the other two, and sometimes New Ferrol or Magdalena. The most remarkable building in Ferrol is the arsenal, an establishment of almost unrivalled magnificence. The manufactures consist chiefly of swords, cutlery, and military and naval equipments; and there are monthly fairs, chiefly for cattle and agricultural produce. The principal imports are steel, yarn, woollen and silk goods, ship timber, earthenware, and colonial produce; the exports are salt meat, salt fish, vinegar, potatoes, garlic, onions, soap, and dried fruits. Pop. 17,404.

FERRY, in law, a right of maintaining a boat at a particular part of a river for the conveyance of people from the one side to the other. This right is originally one of the prerogatives of the crown, and can be enjoyed by a subject only by special grant or by prescription, which supposes a grant to have been made at one time. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. It has been said that the right of ferry is in respect of the landing-place, and not of the water, and that accordingly the original grantee of the ferry must have been the proprietor of the land on both sides of the river, but now it can amount to no more than a legal fiction to refer a right of ferry to the ownership of the land bordering on the ferry, although the conditions on which a right of ferry is held imply that he who enjoys that right must have at least power over the land enabling him to provide the landing-places. A right of ferry does not exclude the proprietor of the land about the ferry from keeping a boat for his own private use, but no one will be allowed to establish a rival ferry so near the original one as to destroy its custom, and the holder of the original ferry has a right of action against any one who does so. Where no private right of ferry exists, the ferries are managed by the trustees of the roads connected with them, or by the justices of the peace, or they are regulated by special act of Parliament. (Bell's Dictionary of the Law of Scotland.)

Ferry boats are generally flat-bottomed, capacious boats, propelled by oars, or where the water is shallow by poles pushed against the bottom of the river. To prevent the boat being carried down the stream by the current there is sometimes a rope stretched from bank to bank, by which the course of the boat is directed, and where a rope is not used, the boat's head is directed obliquely up the stream, so that the boat is propelled upwards at a rate sufficient to balance the current downwards, and the result is that the boat crosses the river in a straight line. Steam ferries are now often used where the current is very strong and the traffic considerable. See FLYING BRIDGE.

FERRYPORT-ON-CRAIG, a village and parish in Scotland, in the county of Fife, on the south shore of the Firth of Tay, opposite to Dundee, and an important ferry in connection with the North British Railway, for the accommodation of which extensive works have been erected. It has the remains of an old castle. The trade consists in imports of coal and timber, and exports of agricultural produce. Pop. 2498.

FERTÉ-SOUS-JOUARRE, in the department of Seine-et-Marne, pleasantly situated on both sides of the Marne, 37 miles E.N.E. of Paris, well-built, possessed of a handsome château, a ruinous old castle, excellent quarries of millstones, which are largely exported, and a trade in corn, flour, and timber. Pop. 4804.

FESCENNINE VERSES, rude verses in the form of a dialogue between two persons, who satirize and ridicule each other's failings and vices; also a sort of dramatic poem, perhaps extemporaneous. They originated in country districts in ancient Italy, but were ultimately introduced into the towns, and even into Rome, and formed a favourite amusement at marriages and on other occasions of festivity. The practice, at first harmless, latterly led to too great license of speech, so that the indulging in this amusement had to be restrained by the law. The amusement is still common in Italy.

FESCH, JOSEPH, Cardinal and Archbishop of Lyons, and brother on the mother's side of Napoleon's mother, was born at Ajaccio in 1763. He had devoted himself to an ecclesiastical life, but quitted it on the outbreak of the French revolution, and became commissary of war to the army of the Alps under General Montesquiou. He held the same office in 1796 under his nephew in Italy. After Bonaparte in 1801 concluded the concordat with Pius VII. he resumed his ecclesiastical status, and became in 1802 Archbishop of Lyons, and next year a cardinal. He was likewise appointed French ambassador at Rome, and made himself very acceptable to the pope by his ultramontane tendencies. He accompanied him in 1804 to Paris for Napoleon's coronation, became grand almoner of the empire, count, and senator, and in 1806 was appointed coadjutor and successor to the prince primate of the confederation of the Rhine. In 1809 Napoleon wished to make him Archbishop of Paris, but the appointment did not take effect, as he had long been at variance with his nephew in regard to his policy toward the Papal see. In 1811 he presided over a national council of the clergy assembled at Paris. The views which he then expressed with great boldness completed his disgrace with the emperor. He lost his dignity in the empire, and was deprived of his prospect of the primacy by the appointment of Prince Eugene as Archduke of Frankfort. He then retired to his see at Lyons, where he lived in a kind of brilliant exile. On the approach of the Austrians in 1814 he fled with his sister, Madame Bonaparte, to Rome, where the pope received him with open arms. Napoleon's return brought him back to France, and he acted as a peer during the Hundred Days, but the battle of Water-

loo sent him back to Italy. When called upon by the Bourbons to resign his episcopal rights he decidedly refused, but in 1825, after a Papal brief interdicted from exercising spiritual jurisdiction, he renounced the office, but retained the dignity. In 1837 an attempt to reinstate him failed, in consequence of the opposition of the government. He lived in the closest intimacy with his sister till her death, and after surviving her nearly three years, died at Rome in 1839. His very extensive collection of paintings, more numerous, however, than select, was disposed of by auction.

FESCUE, the popular name of a genus of grasses (*Festuca*) belonging to the division with many-flowered spikelets on long stalks, and nearly related to the genera *Briza* and *Bromus*. The peculiarities by which the genus is known consist in the outer pale being rounded at the back, which distinguishes it from the genus *Dactylis*, and by its dorsal rib being extended into a sharp point, by which it is terminated. The meadow fescue (*Festuca pratensis*) is a fibrous-rooted perennial, growing from 2 to 3 feet high in low meadows and pastures, where it forms fresh herbage among the earliest of our native grasses. The panicle is narrow, and consists of several lateral branches, bearing from three to five erect spikelets each, in addition to one which stands in the axil of every branch. The spiked or rye-grass fescue (*Festuca loliacea*) is chiefly distinguished from the last by its spikelets being placed alternately on the rachis, which is in no degree branched. It looks as if it were a form of the meadow fescue, with the axillary spikelets alone remaining, and the branches deficient, and is in fact so regarded by some botanists. The hard fescue (*Festuca duriuscula*) is a native of dry sandy places, in which it spreads rapidly by means of its creeping roots. The leaves next the roots are very narrow, almost thread-shaped, rough, with fine points, arranged in two rows on the numerous suckers which this plant throws up in all directions. The stem grows to the length of 1½ or 2 feet, and terminates in a close, rather one-sided panicle. Numerous varieties or supposed varieties of it are known, some of which appear in agricultural works under the names of *Festuca Uhrii*, *Eskia*, *Lemanni*, *præcox*, *purpurata*, *serrata*. Nor does the red fescue (*Festuca rubra*) appear to be distinguishable on any precise grounds; for if its leaves are sometimes smooth, so also do they frequently occur in a very conspicuously hairy state. The sheep's fescue (*Festuca ovina*) is much smaller than the hard fescue, not usually growing more than 5 or 6 inches high when in flower. Of this *Festuca tenuifolia* is a longer-leaved, bright-green variety. Lastly, the tall or giant fescue (*Festuca elatior*) is a coarse reedy grass, found commonly in low swampy situations. It has broader leaves than meadow fescue; its stems grow 4 or 5 feet high, and are terminated by a loose panicle, the branches of which become still more straggling after flowering. The roots are stout, the fibres laying fast hold of the mud or clay in which it grows, and having a manifest tendency to throw up suckers.

FESSLER, Ignaz Aurelius, a Hungarian historian, born at Czurendorf, in Lower Hungary, in 1756; died at St. Petersburg in 1839. In 1773, at the instigation of his mother, an ardent Catholic, he entered the order of the Capuchins, but becoming disgusted with the abuses which prevailed among them, he addressed a private letter to the Emperor Joseph, in which he pointed out the irregularities practised in the order to which he belonged. This brought upon him the rancorous hostility of the clergy, and especially of his own brotherhood, but led to a searching inquiry being made into the state of religious orders; and by an imperial decree Fessler was allowed to quit his order. He was then appointed reader to the emperor, and afterwards professor of oriental languages and hermeneutics in the University of Lemberg. In 1787, on the occasion of a performance of the tragedy of Sidney, written by Fessler, the religious orders denounced him in the most violent manner as an atheist and supporter of revolutionary ideas, on account of the sentiments expressed in it. To escape from his enemies Fessler now retired into Silesia, where he was well received by the Prince of Carolath, who appointed him tutor to his sons. In 1791 he was converted to Protestantism. From 1796 to 1809 he resided in Prussia, and in the latter year was called to St. Petersburg as aulic councillor, and was at a later period appointed professor of oriental languages and philosophy in the university of that city, and member of the commission of legislation. In 1817 he removed to Sarepta, the chief seat of the Moravians in Russia. He was subsequently nominated first superintendent (bishop) of the evangelical church at Saratov, and next general superintendent (archbishop) of the Lutheran Church at St. Petersburg. His chief works are histories and historical romances. Among them are: Marc Aurel (Breslau, 1790–92); Aristides and Themistocles (Berlin, 1792); Matthias Corvinus (Breslau, 1793); Geschichte der Ungarn (Leipzig, 1812–25); and Rückblicke auf meine siebzigjährige Pilgerschaft (Breslau, 1826).

FESTIVALS. The consecration of certain days or longer periods to particular celebrations either in honour of some god, or in commemoration of some important event, is a practice which has prevailed among nearly all nations, both ancient and modern. On this account it is impossible to notice here any but the best known festivals of the leading nations and religions. To begin with those of the Jews: there are six festivals mentioned in the Bible as of divine origin, which hence bear in Scripture the name of *moadeem* or sacred feasts. These are the weekly feast of the Sabbath, the feast of Unleavened Bread or the Passover, Pentecost or the feast of Weeks, the feast of Trumpets or New Moon, the feast of the Day of Atonement, and the feast of Tabernacles. There were other two feasts among the Jews which went by the name of *moadeem* (although not in the Bible), but which were not of divine origin or religious obligation. These were the feast of the Dedication and the feast of Purim. The ancient Egyptians had numerous festivals in honour of their various deities, but none of sufficient importance to deserve separate mention. The Persians celebrated three festivals of victory, and three festivals of liberty. The former were in commemoration of important events in the national history; and the latter had reference to the future triumph of Ormuzd or the good principle over Ahriman or the principle of evil. Among the ancient Greeks were celebrated the Dionysia, in honour of Dionysus; the Eleusinia, in honour of Demeter; the Panathanæa, a festival instituted by Theseus in honour of Athēna, the tutelary goddess of Athens, and celebrated by all the tribes of Attica, the union of which it was intended to confirm and cement. Besides these there were the four great national games, celebrated at various intervals by all the Greeks—the Olympic, the Isthmian, Nemean, and Pythian Games. Among Roman festivals were the Saturnalia, Ambarvalia, Cerealia, Lupercalia, Liberalia, and others held in honour of different gods and heroes. There were besides these the Decennalia or Decennia, held every ten years, under the Roman emperors; the Ludi Sæculares, said to have been held once in every century; and the Feriæ Latinæ, intended to commemorate the union of the Latin tribes.

The festivals of the Christian church owe their origin partly to those of the Judaic religion, such as Easter, which corresponds to the Passover of the Jews, and Whitsunday, which corresponds to Pentecost; partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them into festivals of the church. They were instituted at various periods in the history of the church, sometimes by Papal decrees, sometimes by general councils, sometimes by national councils. These festivals are divided into movable and immovable; the former those which in different years fall on different days, the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of Advent Sunday, depends. (See EASTER.) Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday one week before Easter, and Rogation Sunday falls five weeks, Ascension Day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maunday Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, November 30, whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of January, Epiphany on the 6th of January, the Annunciation of the Blessed Virgin on the 25th of March, the Transfiguration of Christ on the 6th of August; the feast of St. Michael and All the Angels on the 29th of September, the feast of All-Saints on the 1st of November, the festival of All-Souls on the 2d of November, and Christmas Day or the feast of the Nativity of our Lord on the 25th of December. The worship of the Virgin Mary began in the fifth century, at the time when the expression *theotokos* (God-mother), being opposed by Nestorius, and sanctioned by the Council of Ephesus (431) and that of Chalcedon (451), acquired a peculiar importance. The expression itself was already of long standing. The origin of this worship is enveloped in darkness. The festivals relating to the Virgin Mary in the Catholic Church include: the feast of the Annunciation; the Purification of the Virgin, or Candlemas; the feast of the Visitation of Our Lady; the feast of the Immaculate Conception; the Nativity of the Virgin; the Martyrdom of the Virgin Mary; the Assumption of the Virgin (Aug. 6); and several smaller ones. On the 2d of November the festival of All-Souls is observed in the Catholic Church as a day of mourning and commemoration of such of the dead as are not yet admitted to the contemplation of their Maker. The 29th of September is the festival of St. Michael (Michaelmas), which is kept as a general festival in honour of the angels, and may be considered partly as a commemoration of the victory of the good principle over the bad, and partly as a children's feast. August 6 is the festival of the Transfiguration of Christ, which was celebrated with great rejoicing, particularly among the Greeks. The worship of the cross has introduced two festivals: that of the Invention of the Holy Cross (May 3), and that of the Exaltation of the Cross (September 1). The festivals in commemoration of the apostles, the evangelists, and all the other saints also belong to the class of immovable feasts. The saints' days that are still held as festivals, and have religious services connected with them in the Church of England, are called *red-letter* days, because they used to be printed with red letters in the church calendar; while the saints' days which were still retained in the calendar at the Reformation, but had no services connected with them, are called *black-letter* days, because they were printed in black letters. The festivals of the Transfiguration, All-Souls, All the Angels, and Corpus Christi, as well as all except the first three in honour of the Virgin, are not held in the Church of England. In France, according to the arrangement made in the concordat of 1801, no church festivals are kept except these four: Christmas, the Ascension, the Assumption, and the feast of All-Saints, unless they fall on a Sunday. Four others were assigned to the Sunday following the day on which they fell, unless that day happened to be Sunday. These are—Epiphany, the feast of the Holy Sacrament, the feast of St. Peter, and the feast of the Patron Saint.

By the Mohammedans Friday is held as a septenary festival corresponding to the Jewish Sabbath and the Christian Sunday. The two great annual festivals of the Mohammedans are Bairam or Beiram and Ramadan or Ramasan.

When the national convention of France had, in 1793, on the motion of Robespierre, acknowledged the existence of a Supreme Being and the immortality of the soul, and dedicated a national festival on the twentieth of Prairial to the Deity, the following festivals, to be kept on the decade days of the republic, were also instituted:—1, Of the Supreme Being and nature; 2, of the human race; 3, of the French nation; 4, of the benefactors of mankind; 5, of liberty and equality; 6, of the martyrs of liberty; 7, of the republic; 8, of the freedom of the world; 9, of the love of country; 10, of the hatred of tyrants and traitors; 11, of truth; 12, of justice; 13, of modesty; 14, of fame and immortality; 15, of friendship; 16, of temperance; 17, of heroism; 18, of constancy; 19, of disinterestedness; 20, of stoicism; 21, of love; 22, of conjugal fidelity; 23, of filial affection; 24, of childhood; 25, of youth; 26, of manhood; 27, of old age; 28, of misfortune; 29, of agriculture; 30, of industry; 31, of the forefathers; 32, of posterity and felicity. (In the preceding article nothing but the names of the different festivals is given, as separate articles will be found on the more important of those mentioned.)

FESTOON, in architecture, an ornament representing a garland of fruits, flowers, &c., attached at the two ends, and hanging in the middle. It is chiefly used to adorn the friezes of buildings in the Ionic or Corinthian style; and on antique vases, altars, and articles in terra cotta it is not unusual. In modern art this ornament was very skilfully used by Giovanni da Udine, the contemporary of Raphael, as well as by Arthur Quellinus in his decoration of the interior of the town-house at Amsterdam.

FESTUS, SEXTUS POMPEIUS, a Roman grammarian belonging to the third or fourth century of our era, author of an abridgment of a work by Verrius Flaccus, called De Verborum Significatione, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The work of Festus was still further abridged in the eighth century by Paulus Diaconus, whose abridgment was printed for the first time in 1471. The original work of Festus has been preserved in only one MS., and that in a very imperfect condition, which belonged to the library of Cardinal Farnese, and is now preserved at Naples. The edition of the work of Festus by K. O. Müller (Göttingen, 1839), which was prepared with the help of this manuscript, quite superseded all those that had previously been published without its assistance. The chief editions previous to that of Müller are those of Scaliger, Dacier, and Lindemann.

FETICH. This word was first brought into use by De Brosses, in his work Du Culte des Dieux Fétiches (1760), and is derived from the Portuguese *feitiço*, a charm. The Portuguese gave this name to the idols of the negroes on the Senegal, and afterwards the word received a more extensive meaning. A fetich is any object of nature which is regarded with a feeling of awe, as having mysterious powers residing in it. The fetich may be animate, as a cock, a serpent, a panther, or any other animal; or inanimate, as a river, a tooth, a shell. Fetich worship prevails in Guinea and other parts of the west coast of Africa. It is usual for each tribe to have a fetich in common, but in addition to the common fetich every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

FÉTIS, François Joseph, a Belgian musical composer and writer on music, born at Mons, March 25, 1784; died at Brussels, March 27, 1871. He was educated at the Paris Conservatoire, and in 1813 was appointed organist of St. Pierre at Douai. In 1818 he came to Paris, and was a professor in the Conservatoire there from 1818 till 1833, when he was appointed director of the Conservatoire at Brussels. In 1864 be was appointed an officer of the Legion of Honour, and in 1869 grand officer of the order of Leopold. Among his works may be mentioned Traité de la Fugue et du Contrepoint (1825); Biographie universelle des Musiciens (1835–44); Manuel des jeunes Compositeurs des Chefs de Musique militaire et des Directeurs d'Orchestre (1837); Traité complet de la Théorie et de la pratique de l'Harmonie. His musical compositions include operas, sacred music, and instrumental pieces for the piano and the violin. In 1827 he founded the Revue musicale, which he continued to edit till 1835.

FEU, Feu-holding, in Scottish law, a holding by which the vassal enjoys his right of property in consideration of a payment either in money, grain, or agricultural services to his superior. It was anciently deemed an ignoble tenure, in contradistinction to ward-holding, where the services rendered were purely of a military kind; and blench, where they are merely nominal. It is now the most common tenure by which landed, and more especially house property, is held in Scotland.

FEUDAL SYSTEM. A fee, feud, or fief is a possession, of which the vassal receives the right of use and enjoyment, of disposition and alienation, on condition of fidelity, that is, of affording assistance or counsel, and avoiding all injurious acts, together with the performance of certain services incident to the tenure, while the feudal lord still retains a paramount right (*dominium directum*). A fief is distinguished from allodial possessions by the circumstance that it cannot be alienated without the consent of the feudal lord, by the services usually due from the vassal, and by a peculiar kind of inheritance. The system originated among the German tribes, and the nature of feudal property is explained by its origin. Such was the passion of the ancient Germans for war, that in time of peace private feuds took the place of public contention; and in default of these the men of military age spent weeks and months and years in adventures, and made incursions into the territory of the neighbouring tribes, or took part in the quarrels of the distant ones. On these expeditions the experienced and powerful were usually attended by a number of equally valiant youths, who were furnished by the chief with provisions, and perhaps with arms, and composed his retinue or *following* (Latin, *comitatus*). This retinue, which was well known in the time of Cæsar and Tacitus, was bound to the commander by firmer ties than the transient love of war or inconstant success. If the leader did not prove false (which was never known), the attendant devoted his whole life to his service, and was always ready to meet the summons to new adventures. And when the whole nation marched to war, the warriors formed about their chieftain a devoted band ready to sacrifice themselves for his safety. Each of them looked upon the life and liberty of his leader as intrusted to his own peculiar care; and if any one survived his imprisonment or death, he was for ever branded as a coward. The general of the national militia (*Heerbann*), always one of the wealthiest landholders, had a crowd of them constantly about his person. These companions (in German, *Gesellen*, whence the later barbarous Latin word *vasallus*) received no pay except their arms, horses, and provisions, and the portion of the spoils which remained after the chieftain had taken his own share. In the expeditions of particular adventurers against the adjacent tribes or the Roman provinces, their booty consisted of garments, arms, furniture, slaves. But when the northern hordes broke into the south, and in the partition of the conquered lands large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy the possession for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants. From this custom of the ancient Germans arose the feudal system and feudal service, which is purely German.

As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right; and to deprive one of his paternal fief, though it was prohibited by no law, seemed an act of injustice. This change took place between the ninth and eleventh centuries. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. In the case of ecclesiastical fiefs the right of succession belonged, under the same condition, to those who succeeded the last holders in their ecclesiastical office. In that period of lawless violence which followed the migration of nations and the death of Charlemagne, it soon appeared useful and indispensable that those states which were well protected from foreign invasion, though they had no assurance of internal security, should put themselves under the protection of a powerful governor. Powerful barons and rich bishops on one side, dukes and counts, the representatives of the kings, on the other, oppressed the neighbouring free proprietors of landed property till they looked with envy on the dependent vassals, and submitted to the protection of the oppressor, or some other nobleman, in order to obtain security. Many persons, especially the poor, who were obliged to cultivate their land themselves, and could not leave it without much inconvenience, submitted to this protection, though they were in no danger of oppression, merely to escape the military service. For dukes, and counts, and the bailiffs (who acted on behalf of the bishops), whose duty it was to levy and command the army, instead of employing the raw militia, who often forgot their military skill in long-continued peace, preferred their own vassals, and released such of the king's subjects as were willing to become their vassals and pay a certain contribution from the obligation of serving in the national militia. The em-

perors and kings cared little from what source the dukes obtained their forces, provided the number was complete. Besides the advantages just mentioned they even preferred an army of vassals to the national soldiery, because the latter were bound only to serve in the defence of the country, while the former were bound to a much less limited, sometimes unconditional service, and were hence far more useful. Thus the national militia gradually went out of use, and gave place to the feudal militia. Another, and not a small class of men, including the wealthy families, afterwards called the *inferior nobility*, who cultivated their land by means of hirelings or bondsmen, were not anxious to free themselves from the military service, for war was always their favourite employment. But they could not dispense with the protection of the nobles; on the other hand, their pride could not stoop to serve in an army which was every day sinking into disgrace. They longed for the honour of being received among the vassals of the nobility, and consented to hold their estates as the feudatories of the nearest duke, or earl, or bishop. Often, too, from a feeling of devotion, they became the feudatories of the great religious establishments.

All vassals were bound, under the penalty of losing their lands, to follow their lord in all his quarrels against any person excepting other lords of whom they held lands, and excepting also the emperor and empire. Moreover, in war the vassals were required to throw open their fortresses and castles for the use of their masters. The dukes and counts and bishops, who were paid in fiefs for their several services, stood in this relation to the emperor; and inferior landed proprietors stood also in the same relation to the superior nobility (for this was the origin of the inferior nobility). Rich and adventurous peasants likewise, who preferred honourable vassalage to honest but despised patronage, invested some nobleman with their lands, or were invested by him, with the consent of the lord paramount, with a further portion of his feudal territory (under tenants). The investiture was made, from the time of the Saxon emperors, in the great vice-regal fiefs by a banner (which was the ensign of command); in the inferior ones by a sword; and in the spiritual fiefs by a ring and a staff; after the Concordat of Worms in 1122, which confined the power of the emperor to secular affairs, by a sceptre. The *castle-fiefs*, so called, were a peculiar kind of military fiefs, the possessor of which was bound to defend the castle belonging to his lord. The vassal who directed the defence was called, in the imperial fortresses, a *burgrave*. Thus the several orders of vassals formed a system of concentric circles, of which each was under the influence of the next, and all moved around a common centre, the king, as the supreme feudal lord.

With military vassals another class arose. From the oldest times we find in the courts of kings and the governors whom they appointed, as well as in those of the bishops, certain officers who at first performed active service, but were afterwards rather a splendid appendage to the court. The four offices of the marshal, the chamberlain, the cup-bearer, and the sewer, are the oldest and most honourable, but by no means the only ones; offices, on the contrary, were as numerous as the employments which could be devised at court. These officers, at a period when money was scarce and the old German notion in full vigour which considered none but landed proprietors as citizens, and none but the owners of large estates as noblemen, were naturally rewarded by grants of land during the time of service; and these estates, like the military fiefs, but somewhat later, certainly not before the time of Frederick I. (1152–90), became by degrees hereditary. The splendour of the court, and the advantages accruing from these services, induced many noblemen to solicit them. They became the first in the new class of servants or ministers which was thus formed; and under them there was a multitude of other servants, particularly on the estates of the nobility. Every farmer (*villicus*) was paid for the cultivation of one piece of land by the investiture of another smaller piece; and there was scarcely a servant of the court who had not been invested for his services with at least a house or a garden in the village adjoining the castle. The great ministerial officers, too indolent to execute the duties of their offices themselves, with the permission of their lords soon began to commit them to others, whom they paid in like manner for their administration by the investiture of some other estates. Fiefs were gradually introduced which were acquired not by military or court services, but by performing certain duties of no great difficulty, amounting to little more than the acknowledgment of the lord's feudal superiority: as by the yearly gift of a horse, a pair of hounds, a falcon, or the like. Very slight acts were often admitted as acknowledgments, as the holding of a stirrup or walking before the feudal lord on certain occasions. Among the presents and acts are some of a most ridiculous character, according to the humour of the feudal lord: such as dancing before the army, performing some trick, offering an egg, a penny, &c.

A refusal to perform feudal service, or any other violation of fealty, was styled *felony*. Upon this and other difficulties incident to feudal property, as in cases growing out of the succession, surrender, alienation, or under-tenure of a fief, the lord decided in a feudal court, filled by vassals, who were required to be of equal rank with the accused. To appear in these courts at the summons of the lord of the manor, and accept the place of an assessor there, was reckoned among the duties incident to a fief. As the relation of lords and vassals (at that time one of the most important relations in life) became more and more widely spread, and the number of vassals increased at the expense of the ancient immediate subjects of the empire, the latter were thrown into the back-ground, and at length nearly forgotten.

In the tenth and eleventh centuries no duty due from subjects was known except feudal duties; the whole German Empire was one vast feudal possession, and the ideas of feudal lords and national sovereigns were wholly confounded. If any one was neither a lord nor a vassal he was scarcely looked upon as a citizen, and no one took care for his safety. Hence few rich landed proprietors ventured to rely upon their own strength, without a feudal connection. And even most of these at last yielded to the spirit of the age, and became royal vassals (as the lords of Brunswick and Hesse, and the counts in Thuringia, at that period called *dukes* and *landgraves*). The emperor, likewise, used every means to induce them to adopt such a course. Thus, when the haughty Baron of Krenzingen, who was the vassal of no one, refused to do homage to Frederick I., the enraged monarch invested him with the right of coinage, that he might become his lord. On the other hand, it was considered the duty of the German emperor not to extinguish a fief which reverted to the sovereign for want of heirs to inherit it, but to infeoff some other person (though the selection depended entirely on the pleasure of the monarch), and thus to secure the continuance of the feudal system, on which the continuance of the empire seemed to depend; for a reversion of fiefs to the emperor would bring into his hands an excess of power; and a release of the princes from their feudal ties would be followed by a state of anarchy. Besides, the necessary connection

of all the offices with the fiefs rendered the line of separation between them very indistinct; and the service which was paid for a fief was regarded as the fief itself; so that persons were no longer invested with estates as the reward of office, but with the office, as a productive capital, on account of the property attached to it. The dukes, bishops, bailiffs, and burgraves, sometimes from ignorance, and sometimes from interested motives, increased this confusion. They made no difference between their fiefs and the districts and castles for the government of which they were given to them. They exercised in these places, which were filled mostly by their own vassals, the power of feudal landlords, and esteemed any attempt to curtail their rule as an act of flagrant injustice, equivalent to a withdrawal of the fief. In the provinces where the ducal power was early abolished, as in Franconia, Suabia, and Westphalia, the counts and abbots took the same course; while in Bavaria, Misnia, Thuringia, Austria, and Brandenburg, often wholly forgetful of their dignity as imperial governors, they sank into the state of mere vassals to the dukes, landgraves, and margraves, and were hardly able to maintain their under-tenures in a state of dependence.

From the feudal system, the only social organization of the European states in the middle ages, a new system of civil rank arose. The inferior nobility, a rank intermediate between the higher nobility (princes) and freemen, owes its origin, it is said, to this institution; and a regular scale of rank was formed among the vassals, without detriment, however, to the principle of equal birth. The king formed the first class; the spiritual princes, bishops, and immediate abbots constituted the second; the lay princes, dukes, landgraves, margraves, and immediate counts, the third; those barons, or rich landed proprietors, who owed fealty to no one, but yet, on account of their limited rights or possessions, were the vassals of the emperor, the fourth; those freemen who stood in the same relation to the princes, the fifth; the vassals of the former and the servants of the princes, the sixth; and the possessors of small fiefs, the seventh. This arrangement corresponds to the Italian division into *principes, capitanei, valrasores majores, valvasores minores, valvasini*, and *soldati;* the English into lords, esquires, and freeholders; the Spanish *grandees* (*ricos hombres*, rich men), *escuderos, hidalgos;* and the French *pairs, barons, ecuyers*, and *valvasseurs*. The title *ecuyers, escuderos, esquires*, however, belongs rather to chivalry. Besides these ranks, after some centuries, the order of citizens was formed, as being included under no one of them. The spirit of the feudal system, grounded on the prevalence of landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. Hence we see them almost always involved in open hostilities and contests with the nobility.

The principles of the *feudal laws* (the name given to the system of rights and obligations existing between feudal lords and vassals) were developed and established by the Lombard lawyers of the twelfth century. The collection of feudal laws and customs which is appended to the Roman code under the title of *libri feudorum*, has become the code of feudal law over half of Europe. In the north of Germany, Denmark, Prussia, Poland, &c., the old German feudal code still obtains, which differs from the Lombard code chiefly in not acknowledging the right of collateral relations, as such, to succeed to a fief; and in grounding the right of feudal succession, not on descent from the first possessor of the fief, but only on community of possession; so that divisions destroyed the right of inheritance. In place of this community similar force has been given since the twelfth century, in the above-mentioned countries, to a merely formal union, instituted in the first investiture, and preserved and renewed in all cases of division or death (joint investiture).

The feudal government, at a period when a spirit of independence and of opposition to despotism was abroad in the land, was well suited to put into the hands of one governor, as supreme feudal lord, the reins of the national power, to be employed against foreign enemies without endangering domestic freedom. But as every human institution bears in itself the germ of decay, the purity and influence of feudal relations was diminished; and the strength of the national government declined amidst a spirit of disaffection and sedition, which became universal when nobles began to perceive that the feudal government was not naturally dependent on kings, but kings on it. Indeed, the sovereigns had no other security for their subjection than the feudal oath, and the menaces of punishment, which the king had not the ability to carry into effect, as his power was divided in most of his states, either by investiture or by the usurpations of the princes. Thus the vassals of the crown in Germany, Italy, and the oldest districts of France, succeeded in depriving the king of almost all power, even of the external honour of royalty; and never, in the two first countries, and in France only after the extinction of the great baronial families, could he succeed in establishing a new authority, independent of the feudal power.

As the improvements in the art of war had brought about a total change in modern times, and the feudal militia had been entirely superseded by the standing armies, the feudal government had no means of retaining its authority but by the feudal services of a civil character. The feudal system is a relic of the past, too useless and inconvenient, and too much opposed to the principles of the modern laws of equality, to be any longer maintained. Feudal service is no longer demanded, because it has ceased to be useful. It has been, and still is, the great task of the present age in Europe, to overthrow the feudal system—an order of things which grew out of times of barbarity and disorder, and rested on principles and circumstances which no longer exist. Yet there are, particularly among the Germans, visionary men who, seduced by the glowing descriptions of old ballads, or the fine structure of a Gothic cathedral, tell us that the feudal times were the very model of an age of honour and religion. It is well for them that they cannot test their opinions by their own experience. See ENGLAND — Institutions under the Norman Kings.

FEUERBACH, PAUL JOHANN ANSELM, RITTER VON, one of the most celebrated of German criminal jurists, was born at Jena in 1775, and was educated at the gymnasium of Frankfort-on-the-Main, and afterwards at the university of his native town. After strengthening his mind with philosophical studies he turned with zeal to prosecute that of law. Having published his first work, entitled Anti-Hobbes, in 1798, he began in 1799 to deliver academic lectures in Jena, and by a succession of works on crimes and punishments placed himself at the head of the new school of criminalists, the so-called rigorists, who make the judicial sentence entirely to depend on the decision of the penal code. In 1801 he became an ordinary professor at Jena, but the following year accepted a chair at Kiel. In 1804 he obtained an appointment in the University of Landshut, where he was employed to draw up the plan of a criminal code for Bavaria, and was in consequence in 1805 appointed privy referee in the ministerial, justiciary, and police departments at Munich, and in 1808 privy-

councillor. His penal code for Bavaria, after being repeatedly tested and somewhat modified, received the royal assent in 1813, and has been adopted as the groundwork of new codes in Saxe-Weimar, Würtemberg, and other territories, received as the code of Oldenburg, and translated into Swedish. In 1807 he began on the royal command to convert the code Napoleon into a civil code for Bavaria, but it has never come into operation. In 1817 he was appointed second president of the appeal court at Bamberg, and in the same year first president of the appeal court for the circle of Rezat at Anspach. As everything relating to public life attracted his attention, he also applied the principles of freedom and justice to religious and ecclesiastical matters, and maintained an incessant warfare with the hierarchical tendencies and encroachments of his time, whether exhibited by Protestants or Roman Catholics. In the last years of his life he took a particular interest in the fate of the unfortunate Caspar Hauser. He died in 1833 at Frankfort-on-the-Main, while on his way to the baths of Schwalbach. Among his most interesting and important works are Remarkable Criminal Trials (two vols. Giessen, 1808–11), and Themis, or Contributions to the art of Law-making. An interesting biography of him has been written by his son (two vols. Leipzig, 1852).

FEUILLANTS, in ecclesiastical history, a religious order clothed in white and going barefoot, who lived under the strict observance of the rule of St. Bernard. The name was occasioned by a reform of the order of Bernardins, first made in the abbey of Feuillants, near Toulouse, established in 1577. There were also convents of nuns who followed the same reform, called *Feuillantines*. The first of them was established near Toulouse in 1590. Eleven years later the order transferred its head-quarters to Paris, and continued to flourish until suppressed, along with other religious orders, by the revolution of 1789. The monastery was taken possession of by a club celebrated in the political history of France under the name of the Feuillants, and of which Mirabeau was a member. It was a weak rival of the Jacobin club, and fell before the clamour of a mob in 1791.

FEVER (from Latin *febris*, connected with *ferveo*, I burn) may be described thus:—After a degree of chilliness and shivering, accompanied and succeeded by a feeling of languor, restlessness, weakness, nausea, and want of appetite, and more or less headache, there is preternatural heat of the body, which is indicated by a dry, burning skin; there is also excessive thirst, cold water being the drink which the patient has the most craving for. The pulse becomes much accelerated, there is increased waste of tissue, great muscular debility, and most of the functions are disturbed. This morbid state is noticeable amongst the phenomena of many diseases, and is then termed *symptomatic fever*, but the same symptoms, when observed in other circumstances, are characteristic of the *fevers* proper, which may be classified as follows:—

1. *Continued Fever.*—(1) Simple fever, or febricula. (2) Typhus fever. (3) Typhoid, enteric, or gastric fever. (4) Relapsing, or famine fever.

2. *Intermittent Fever, or Ague.*

3. *Remittent Fever.*—(1) Simple remittent fever. (2) Yellow fever.

4. *Eruptive Fevers.*—(1) Small-pox. (2) Cow-pox. (3) Chicken-pox. (4) Measles. (5) Scarlet-fever. (6) Erysipelas. (7) Plague. (8) Dengue fever.

Simple fever, or febricula, may last from one or two to ten days, and may arise from cold or any slight cause, disordering the several functions of the economy. It commences with a feeling of chilliness, and thus is often attributed to having caught a chill. There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. After a few hours the pulse becomes accelerated, and the temperature of the body rises; these phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels, and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a few days the symptoms abate, and the patient begins to recover, but very often the convalescence is somewhat slow.

The treatment consists in endeavouring to reduce the condition of excitement present in the organs of circulation by means of saline purgatives, rest in bed, a diet consisting chiefly of milk and nourishing soups, hot fomentations over the bowels, or, if necessary, the wet sheet as used by hydropathists. If the powers of the system begin to flag, they must be sustained either by increasing the quantity of milk and strong soups, to the exclusion of other fluids, or by the judicious administration of stimulants. A strict watch must also be kept over the different organs, such as the brain, liver, kidneys, lungs, &c., so that we may obviate, or, if they occur, treat inflammations and congestions in these organs. It is always very desirable to procure a free action of the skin, and with this end in view diaphoretic medicines given every three or four hours prove of immense service, but if recourse is had to the hydropathic pack this answers the purpose equally well.

FEVERFEW (*Pyrethrum parthenium*, or *Matricaria parthenium*), a common wild, composite biennial, frequent in waste places and near hedges. It has a tapering root, an erect, branching stem about 2 feet high, and stalked, compound leaves of a hoary green colour, and ovate cut leaflets. The flower-heads grow in a corymbose panicle. The involucre is hemispherical, and composed of numerous imbricated, short, membrane-edged scales. There is a very slight pappus in the form of a membranous cup. The plant possesses febrifugal, tonic qualities; it is very bitter, strong scented, and stimulating and antihysteric. It has long been regarded as an emmenagogue, and employed with success in suppressed menses, and as a relief to the pains succeeding parturition. It is used in infusion in the same way as chamomile.

FEZ (Latin, *Fezza;* Arabic, *Fás*), an important city, Marocco, nominally the second, but in reality the principal city in the empire; 100 miles east of the Atlantic, 85 miles south of the Mediterranean, and 245 miles north-east of the city of Marocco. It is finely situated on the slope of several hills, which surround it on every side except on the north and north-east, and whose acclivities are covered with orange groves, orchards, and gardens. It is divided by a small stream (Pearl River) into the New and Old City. Both are surrounded by walls, now in a state of utter decay. The streets are narrow, dark, and extremely dirty, especially in rainy weather. The houses are high and flat-roofed, with a projection on the first floor, which intercepts much of the light. Every trade or profession has a street or section of the town allotted to it. Provision markets are numerous, and abundantly supplied. There are, it is said, upwards of 200 mosques in the city, the principal of which is called El Caroubin, which contains 300 pillars, a number of gates, and two handsome fountains in the court. The most frequented mosque is that of Sultan Muley Edris, the founder of Fez, who is venerated as a saint, and whose remains are deposited here. This mosque is the most sacred sanctuary in all the country, affording safety and protection to the most atrocious criminal. All the other mosques, with exception of that belong-

ing to the palace of the sultan, are small and mean. The only other remarkable building to be seen is the sultan's palace, situated on an elevation in the new city. It is composed of a great number of courtyards, some half-finished, others going to decay. Its gates are always kept closed, and are, besides, vigilantly guarded, no persons but those particularly privileged being admitted. There are a great number of public baths, and several hospitals, one of which, for the treatment of lunatics, is richly endowed. There are nearly 200 caravanserais or inns. The manufactures consist of woollen cloaks, sashes, silk handkerchiefs, slippers, the leather of which they have the art of tanning in high perfection; red caps of felt, extensively used throughout the north of Africa, and, from the place of manufacture, named fezes; coarse linen, fine carpets, common earthenware and saddlery. The climate of Fez is intensely hot in summer, and is, on the whole, unhealthy. Fez, founded in 793 by Muley Edris, was capital of an independent state, and subsequently became so famous as a seat of Arabian learning that its schools of philosophy and physical science were resorted to not only from all the Mohammedan states of Africa and Spain, but even from Christian countries. The remains of its institutions still attract round them a number of Mohammedan doctors, and the schools are frequented by a great many scholars; but the studies are confined to the Koran and its commentators, with a slight tincture of grammar and logic, metaphysics, alchemy, and astrology. Fez is considered a holy town by the Western Arabs, and was also resorted to by them as a place of pilgrimage when the way to Mecca was obstructed. After its conquest, in 1548, by Morocco, it commenced to decline, but recovered for a time after the fall of the Kingdom of Cordova, and in consequence of edicts of Philip II. against the Mohammedans. Pop. estimated at 88,000; composed of Moors and Arabs, 65,000; Berbers, &c., 10,000; Jews, 9000; Negroes, 4000.

FEZ, KINGDOM OF, once an independent state, now the most northern section of the Empire of Marocco; bounded north by the Mediterranean; east by Algeria; south by the river Om-er-begh or Morbeza, which separates it from Marocco Proper; and west by the Atlantic. It was conquered and united to Marocco in 1548.

FEZZAN (ancient *Phasania*), a kingdom of North Africa, usually considered as lying between lat. 24° and 31° N., and lon. 12° and 17° E., being thus about 460 miles in length, and about 300 miles in breadth, although its limits have not been accurately defined. It is bounded by Tripoli on the north, and on all other sides by the Sahara or Great Desert. In the northern parts are three ranges of mountains, or rather hills, as none of their elevations exceed 1200 to 1500 feet. One of these, called the Soudah, or Black Mountains, is composed of basalt, nearly black, with a shining or polished appearance. They are perfectly barren, of irregular form, occasionally broken into detached masses, and sometimes rising into conical peaks. To the south of these ranges the country consists of extensive sandy plains, alternating with ridges of low hills, the valleys of which contain nearly all the cultivable soil in the territory. Dates are the principal produce, and form the chief food of the inhabitants; small quantities of maize and barley are also grown. Figs, pomegranates, lemons, and legumes are plentiful; as are also pot-herbs and garden vegetables. There are no rivers or brooks, and few natural springs; but water is found in abundance at various depths, generally from 10 to 20 feet. There are a few small lakes, the surfaces of which are sometimes covered with a thin crust of carbonate of soda. In summer it is extremely hot, but in winter the cold is pretty severe. Rain seldom falls; in some districts it does not rain for years together, and but little at a time. With exception of goats, few domestic animals are reared. In the southern parts some flocks of a peculiar kind of sheep are met with, and in the most fertile districts a few horned cattle. The wild animals, which are abundant, are lions, panthers, hyenas, jackals, tiger-cats, gazelles, and foxes. The birds of prey are vultures, falcons, &c.; there are also ostriches and bustards. The lower classes of the people are industrious, and some of them work skilfully in gold, silver, and iron. The only manufactures of the country are a little coarse linen and cotton cloth. But a considerable trade is carried on by caravans with Timbuctoo and Bornou; while Mourzook, the capital, is the rendezvous of caravans coming from Cairo, Bengazi, Tripoli, Ghadames, Touat, and Soodan. The natives of Fezzan are of a mixed race, and are of middle stature, black complexion, with hair inclining to woolly, high cheek-bones, nose less depressed than in the negro, small eyes. They are cheerful, fond of dancing and music, obliging to each other, neither passionate nor revengeful, but fraudulent, cowardly, and abject. Their houses are mostly of mud. The principal towns are Mourzook, towards the southern boundary, and Sockna, towards the northern, distant from each other about 230 miles. There are other eight or ten towns, and a vast number of villages. Fezzan is governed by a chief, who has the title, and exercises the power of a sultan within his own territory, but since 1842 has been dependent on the Sultan of Turkey. In time of war the sultan is said to be able to bring from 15,000 to 20,000 men into the field. The pop. has been variously estimated at 75,000 and 150,000.

FIARS, in Scots law, the prices of grain in the different counties fixed yearly in the month of February by the respective sheriffs, assisted by juries, each of which should consist of eight heritors, a few farmers, and some neutral parties, especially one or two able to check the calculations. An experienced accountant is sworn, but is not on the jury, and is paid a fee from the county rates. Evidence is laid before the jury of the prices of the different grains raised in the county; and the prices fixed by the opinion of the jury and sanctioned by the judge are called the *fiars* of that year in which they were struck, and regulate the prices of all grain stipulated to be sold at the fiar prices; and in many sales it is agreed to accept the rates fixed by the fiars. Ministers' stipends, in so far as they consist of grain and crown dues, are also paid by the fiars prices of the county for each year. The fiars price of all grain in every county must be struck by the imperial quarter, and any sheriff-clerk, clerk of a market, or other person offending against this provision shall forfeit a sum not exceeding £5. In cases of necessity the lords of council and session still interpose their authority to regulate the striking of the fiars by act of sederunt.

FIAT (Latin, let it be done), in English law, a short order or warrant from a judge for making out and allowing certain processes.

FIBRES USED IN MANUFACTURE. The textile fibres may be divided into three classes—mineral, animal, and vegetable. Of the first class the sole representative is found in amianthus, a variety of asbestos; of the second the silk obtained from the cocoons of the silkworm, and the wool of the sheep, are the more notable examples. But the wool or hair of other quadrupeds has been used to some extent, as of the goat, from the Angora species of which are obtained the materials of which mohair, Cashmere shawls, and in France a brilliant kind of lace

are made; of lesser importance are the hairs of the llama or alpaca, the camel, the bison, the musk ox, the yak, and the chinchilla. The third class furnishes by far the most numerous and varied specimens. Cotton is obtained from the fibres of the fruit of species of *Gossypium;* flax from the fibres of the inner bark of *Linum usitatissimum;* jute in the same manner from *Chorchorus olitorius, C. capsularis,* &c.; hemp from *Cannabis sativa;* from the leaves of *Phormium tenax* is obtained New Zealand flax; Pita flax from *Agave Americana;* Manilla hemp from species of Musa; coir from the husk of cocoa-nut; mats, chair-bottoms, &c., are obtained from various species of Cyperaceæ. For fuller details see the articles COIR, COTTON, FLAX, HEMP, JUTE, SILK, and WOOL.

FIBRIN. This constitutes the solid matter or clot, coloured by the red corpuscles, which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus, and other pathological fluids. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from colouring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances. If the clot be taken it must be cut fine and well washed, but the trembling gelatinous mass is not so easily dealt with as the long slender elastic fibres. After it is purified it forms an opaque white or yellowish stringy mass, with a smooth greasy appearance, insoluble in water, but softening in the air and becoming dark. Its chemical constitution is quite unknown, and only its percentage composition has been determined. It is as follows:—Carbon, 52·6; hydrogen, 7; nitrogen, 17·4; oxygen, 21·8; sulphur, 1·2; but when burned it leaves an appreciable ash containing phosphoric acid. It belongs, therefore, to the albumens, and corresponds pretty closely to casein and egg albumin. It is insoluble in alcohol and ether, but is taken up more or less readily by alkalies and by acids. Thus, when treated with a dilute alkali it dissolves, forming an alkaline albuminate, and the solution is not precipitated on heating. Fibrin is soluble also in a solution of nitre and of common salt, so that the brine of salted meat contains this ingredient of the flesh. These solutions, when heated, are reprecipitated, and re-solution does not occur. If the fibrin be previously heated to about 140° Fahr. it is no longer soluble in salt, but seems to undergo a kind of coagulation. Fibrin is distinguished from other albuminous bodies by its power of decomposing hydric peroxide into water and oxygen by mere contact. In this reaction, discovered by Thenard, the fibrin remains apparently unchanged, but the explanation of it advanced by Schönbein is not quite conclusive. When acted on with nitric acid fibrin becomes yellow, like other albumins. The cause of the coagulation of fibrin has been long a topic of discussion. One of the general conclusions is, that fibrin is not contained in the fluids ready formed, but that there are two substances called respectively the *fibrinoplastic* and *fibrinogenic,* which give a coagulum of fibrin when brought in contact. It is quite certain that these two bodies can be obtained separate from each other. If a current of carbonic acid gas be passed through blood plasma (or blood deprived of its globules) a white flocky precipitate is produced. This is fibrinoplastic substance, so called because when added to certain non-spontaneously coagulable organic liquids, it makes them coagulate almost at once. It does not do this with all protein liquids, but it does produce this effect with blood plasma. The substance with which it reacts is fibrinogen, a glutinous body precipitated from the organic fluids already spoken of. When these two bodies are mixed with due care, a clear solution is at first obtained, which afterwards coagulates spontaneously, just as blood would do, and, as a further confirmation, it has been observed that if blood be deprived of one or other of these constituents no coagulation ensues. The formation of fibrin, or, in other words, the coagulation of the blood, takes place more readily at a high than at a low temperature; and the temperature of the blood is said to be particularly favourable, so that the plastic constituents are possibly undergoing constant conversion into fibrin. See PARAGLOBULIN, METAGLOBULIN.

FIBROFERRITE, described by Field, is a pale, golden green mineral, consisting of hydrated basic sulphate of iron. It is soluble somewhat in water, but is decomposed on heating. It is met with in Chili in fibrous masses, which gradually scale off.

FIBROIN, a substance obtained from silk by removing from it albumen, fatty, resinous, and colouring matters, &c. It is silky, swells up on heating, and burns with a nitrogenous odour. It is insoluble in acetic acid, water, alcohol, ether, &c., but dissolves in an ammoniacal copper solution. The same substance was formerly said to be extracted from sponge, and from some other animal products, but from their deportment with certain reagents they appear to be different.

FICHTE, JOHANN GOTTLIEB, was born of poor parents at Rammenau, near Bischofswerda, in Upper Lusatia, in 1762, and owed his early instruction to the assistance of Baron Von Miltitz. At a later period he received a classical education at the famous *Schulpforte,* one of the Saxon Royal Schools. He then studied at Jena, Leipzig, and Wittenberg, passed several years as a private tutor in Switzerland and in Prussia Proper, and in Königsberg enjoyed the society of the great Kant. His Versuch einer Kritik aller Offenbarung (Essay towards a Criticism of all Revelation, Königsberg, 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. In 1800 he was one of the most prominent professors of that university during its most brilliant period. Here he published, under the name of Wissenschaftslehre (Theory of Science), a philosophical system, which he founded at first on the system of Kant, from which, however, he gradually deviated. On account of an article, Ueber den Grund unseres Glaubens an eine Göttliche Weltregierung (On the Reasons of our Belief in a Divine Government of the Universe), which appeared in his periodical Philosophisches Journal (vol. viii. No. 1), he fell under the suspicion of atheistical views. This gave rise to an inquiry, and Fichte, exasperated at the proceedings, resigned his professorship. After publishing an appeal against the accusation of atheism he went to Prussia, where he lived for some time in private at Berlin. In 1805 he was appointed professor of philosophy at Erlangen, with permission to spend the winter at Berlin. During the war between Prussia and France he went to Königsberg, where he delivered lectures for a short time, returned to Berlin after the Peace of Tilsit, and in 1810, on the establishment of the university in that city, was appointed professor of philosophy. Fichte's philosophy, though there are two distinct periods to be distinguished in it, is a consistent idealism, representing all that the individual perceives without himself, or, rather, all that is distinguished from the individual, the *ego,* as a creation of this *I* or *ego.* It would be impossible to give our readers, in so short a space as this work will allow, an intelligible view of his bold system. We must refer the student to his Ueber den Begriff der Wissenschaftslehre (Jena, 1794); Die Wissenschaftslehre in ihrem allgemeinen

Umrisse (Berlin, 1810); and the Anweisung zum seligen Leben (Berlin, 1806). His practical is purer than his theoretical system. His idealism led him to represent the life of the mind as the only real life, and everything else as a mere delusion, and to believe in an almost absolute omnipotence of the will. To excite his pupils to the highest virtue and self-denial was his constant aim as a teacher, and his influence was great, not merely through his power of expression and the originality of his ideas, but through the conviction with which he inspired his hearers of his full belief in, and entire devotion to, his principles. His heart was open to every noble and good feeling. Unshaken integrity, constant friendship, devoted love of what he conceived to be true and good, were his characteristic traits. His own excellence of life sometimes made him not very indulgent towards others; and some of his doctrines, which every one would acknowledge to be good in the main, he carried too far. When Germany was bleeding under the wounds of war he, like his countrymen in general, considered Napoleon as the source of the whole distress of his country, and in his Reden an die deutsche Nation (Addresses to the German Nation), published in Berlin while it was still in the hands of the French, he boldly called upon his countrymen to rise and throw off the foreign yoke. Fichte's wife was a Swiss. At the time of the battles near Berlin, in 1813, when the city was full of Prussian and French wounded soldiers, females of all classes served in the hospitals, the male inhabitants being all engaged in the war. Fichte's wife, who was among the ladies thus employed, was attacked by the hospital fever, then raging in the city. She recovered, but her husband, who had paid unwearied attention to her, was in his turn attacked by the disease, and died in consequence in January, 1814. He left a son, Immanuel Hermann, who, in 1830–31, gave to the world a Biography of J. G. Fichte, with his Literary Correspondence. The popular works of the philosopher, known in England through the translations of W. Smith, consist of—The Vocation of the Scholar, The Nature of the Scholar, The Destination of Man, The Characteristics of the Present Age, and The Way towards the Blessed Life.

FICINO, Marsilio, a celebrated philosopher of the Platonic school, born at Florence in 1433. His father was the physician of Cosmo de' Medici, who held him in high estimation. His early display of talent attracted the notice of Cosmo, who caused him to be instructed in the ancient languages, and afterwards induced him to translate the writings of Plato and of the New Platonists into Latin; he afterwards employed him to aid in establishing a Platonic Academy (about 1460). Ficino engaged in this plan the more readily, because he viewed the Platonic philosophy as a sort of preliminary to, and confirmation of, the Christian faith. In his accounts of this philosophy he did not always make an accurate distinction between Plato and the New Platonists, as appears from his Theologia Platonica; de Immortalitate Animorum ac æterna Felictitate (Platonic Theology; on the Immortality of the Soul and Eternal Happiness), in which he particularly defends the immortality of the soul against the Aristotelians of his age. Mystic and fanciful views are interwoven with this defence; astrological doctrines, for example, which he afterwards rejected. At the age of forty he determined on entering the church, and was presented by Lorenzo de' Medici with the rectorship of two Florentine churches, and a canonry in the cathedral. He died 1499, after having formed many excellent scholars by his writings and discourses. His Latin works were first published complete at Basel, 1561, two vols. folio.

FICTION. See Novel and Romance.

FICTION, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. There are many fictions in the civil law, and a fiction in law is said by the civilians to be the assumption of an untruth for a truth, in a thing possible to have been done, but which was not done. The declaring that a note or bond made in a foreign country was made in the county where a suit is commenced upon it, is an instance of a very common fiction, adopted on the ground that suits can be brought in the county only on causes of action existing within its limits; and so the practice has been introduced of declaring that the contract on which an action is brought was made in the county, though the fact seems to be entirely immaterial; for transitory actions follow the person, and it is only of such that the fiction is admitted. The fictitious characters of John Doe and Richard Roe long contributed to render the action of ejectment famous. But other fictions are more material. To this day in England, in an action at the instance of a father for the seduction of his daughter, damages are only awarded on the assumption that she is his servant, and that he has suffered pecuniary loss by deprivation of her services. It is a rule that a fiction of law shall work no wrong; and the fictions in use generally come within this rule.

FIDDLE. See Violin.

FIDEICOMMISSUM, in the civil law, a direction of a testator that his heir shall give a particular thing (*singulare fideicommissum*), or a part or all of the inheritance (*universale fideicommissum*), immediately, or after a certain time, or on the occurrence of certain circumstances, to another. The heir, who was thus obliged to cede the inheritance to another, was called *fiduciarius*, the receiver *fideicommissarius*. Under Vespasian it was decreed that the fiduciarius should be allowed to retain a quarter of the inheritance at the time when he gave the rest to the fideicommissarius. The modern *fideicommissa* are very different. They are establishments by which an amount of property is made unalienable, and the order of inheritance prescribed. In most countries of Europe such fideicommissa cannot be established except with the permission of government; and in these countries the governments can also declare a fideicommissum dissolved, so that the estate shall follow the common rules of inheritance. From such family fideicommissa (*fideicommissa successiva*) the quarter of the inheritance, of course, is not deducted.

FIELD, Magnetic, or Field of Magnetic Force, a term introduced by Faraday to designate any space possessing magnetic properties. A space may possess magnetic properties either on account of magnets in its vicinity, or on account of currents of electricity passing through or round it. The conception of the magnetic field is of great importance in the mathematical theory of magnetism. In order to express the condition of the field of magnetic force, it is necessary to specify the direction and intensity of the force at every point in it. Faraday has shown how to examine the magnetic field experimentally, and Professor J. Clerk Maxwell, in a paper On Faraday's Lines of Force (Cambridge Philosophical Transactions, 1857), and subsequently in his work on Electricity and Magnetism, has shown how the properties of the magnetic field may be expressed mathematically. Faraday employed the conception of *lines of magnetic force*, which he pictured to the imagination as traversing the field of force. A line of magnetic force is a line drawn from any origin or starting-point, so that at every point of its length its tangent is the direction of the attraction at that point. If a very short magnet is delicately suspended in

such a way as to be able to turn in any direction about its centre of inertia, and if it were carried from point to point in the magnetic field it would indicate at each point the direction of the magnetic attraction. If such a needle were carried from any origin or starting-point, *always in the direction in which it points*, it would trace out a line of magnetic force passing through that origin. By drawing these lines of force according to rule, Maxwell indicates the intensity of the force at every point as well as its direction. Thus 'if in any part of their course the number of lines passing through unit of area is proportional to the intensity, then the same proportion between the number of lines in unit of area and the intensity will hold good in every part of the course of the lines. All that we have to do, therefore, is to space out the lines in any part of their course, so that the number of lines which start from unit of area is equal to the number representing the intensity of the field there. The intensity at any other part of the field will then be measured by the number of lines which pass through the unit of area there: each line indicates a constant and equal force.' A 'uniform field of force' is a field in which the lines are straight, parallel, and equidistant. Any space on the earth's surface unaffected by the presence in it of magnets or magnetic matter, is a uniform field of force. Faraday has shown in his Experimental Researches how to obtain from artificial magnets, with properly shaped poles, a uniform field of force.

FIELD-ALLOWANCE, an extra payment made to officers of the British army on active service in the field, to compensate partly the enhanced price of all necessaries. Ordinary field allowance, ranging from 30*s.* per day for a general officer, to 1*s.* for a subaltern, is granted when troops are encamped at home or in the colonies; extraordinary field-allowance, whenever troops are engaged in actual warfare, ranges for the above ranks from 50*s.* to 1*s.* 6*d.* No officer is entitled to this allowance unless positively present with the army.

FIELDFARE (*Turdus pilaris*), a species of thrush. The length is between 10 and 11 inches, alar extent 17½ inches, and the weight about 4 oz. It is a stout bird, and from its long tail and wings rather elegant in form. In colour it bears a great resemblance to the generality of thrushes; the upper parts of the body as far as the shoulders are ashen gray, dotted with dark-brown spots on the head; the back and wings are rich brown, and the tail blackish brown; the chin and throat have a peculiar hue not unlike amber, and are covered with numerous black streaks; the breast is reddish brown, also spotted with black, and the abdomen and under parts white spotted on the flanks with various shades of brown. The bird is a winter visitant of Britain, seldom seen until November or December, and then making its appearance in great flocks. It departs about May or June. They have sometimes been observed to build in this country, but the northern parts of Europe, such as Norway and Sweden, is where they chiefly breed. They frequently build in society, and as many as two hundred nests may be found within a short distance of each other. Their food consists of hawthorn and other berries, worms, larvæ, insects, seeds, and grains. The bird's first shyness on its arrival in Britain soon wears off, and it becomes a tempting object to the young sportsman on his Christmas holidays.

FIELDING, Copley Vandyke, a distinguished painter in water-colours, was born about 1787, and early attracted attention by his water-colour landscapes. He gained also considerable reputation as a teacher, and for many years before his death was president of the Society of Painters in Water-colours. His pictures are chiefly taken from English scenery, the various features of which, both in rich woodland and open plain, he has represented with great delicacy and truth. Oil-painting was also attempted by him, but with no great success. He died at Worthing, Sussex, in 1855.

FIELDING, Henry, was born at Sharpham Park, in Somersetshire, the seat of his father, General Edmund Fielding (a member of the Denbigh family), April 22, 1707. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and the same cause, added to a dissipated disposition, turned his attention to the stage. His first dramatic piece was entitled Love in several Masks, which met with a favourable reception, as did likewise a second, called the Temple Beau. He did not, however, generally succeed as a dramatist; for although no man possessed a stronger feeling of the ridiculous, or executed detached scenes with greater humour, he took too little time to construct his dramas, with a view to plot and effective development. Many of his are little more than free translations from the French, as, for example, The Miser, the Mock Doctor, &c. In some of these pieces he touched upon politics, and was one of the writers who gave Sir Robert Walpole a pretext for his act to limit the number of theatres, and submit dramatic performances to the licence of the lord-chamberlain. In his twenty-seventh year he married Miss Craddock, a lady of some fortune, and at the same time, by the death of his mother, became possessed of a small estate in Dorsetshire. He immediately commenced country gentleman on a scale which, in three years, reduced him to greater indigence than ever, with a young family to support. He then, for the first time, dedicated himself to the bar as a profession, and for immediate subsistence employed his pen on various miscellaneous subjects. The Champion, a periodical paper, An Essay on Conversation, and An Essay on the Knowledge and Characters of Men, were among the early fruits of his literary industry. In 1742 appeared his first novel, Joseph Andrews, in which the Cervantic style of humour is admirably imitated, and in which also the overstrained sentimentality of Richardson is unsparingly ridiculed. It immediately received the attention to which it was entitled. His next publications were A Journey from this World to the Next, and the History of Jonathan Wild. Soon after the appearance of Joseph Andrews he was further impeded in his profession by repeated attacks of the gout, added to which, his domestic affliction was greatly increased by the death of his wife. In 1745 he published a periodical paper entitled The True Patriot, which was followed by the Jacobite Journal. These labours on the side of the government were rewarded with the then not altogether reputable office of a Middlesex justice. To the credit of Fielding, however, he did much to render it more respectable by attention to the prevention of crimes, and to the regulation of the police. He published more than one tract upon the subject; and the principal of them, his Inquiry into the Cause of the late Increase of Robbers, &c., made a great impression at the period. It was in the intervals of those serious occupations that he wrote his celebrated Tom Jones, which was followed in 1751 by Amelia. At length, however, his constitution began to yield to the repeated attacks upon it, and he was recommended by the faculty to take a voyage to Lisbon. He followed their advice; and the last gleams of his wit and humour are to be found in his journal on that occasion. He reached Lisbon in August, 1754, and about two months after expired. The chief merits of Fielding as a novelist are wit, humour, correct delineation of character, and know-

ledge of the human heart. No novel exceeds Tom Jones in the exhibition of character and manners, in the development of the story, and the management of the catastrophe. Amelia, with less variety and invention, is, in regard to portraiture and knowledge of life, almost equally felicitous; while, as to pure raciness of humour, Joseph Andrews is often deemed before both. Even Jonathan Wild, coarse as are the persons and doings described, is irresistible in the way of humorous caricature, as well as instructive as a satire.

FIELDING, SARAH, third sister of Henry Fielding. She was born in 1714, lived unmarried, and died at Bath, where she long resided, in April, 1768. She was the author of the novel of David Simple; a less popular production of a kindred class, called The Cry, a dramatic Fable; Xenophon's Memoirs of Socrates, translated from the Greek (for which she was favoured with some valuable notes by Mr. Harris of Salisbury); The Countess of Delwyn; The History of Ophelia; The Lives of Cleopatra and Octavia; and one or two more of a minor class.

FIELD-MARSHAL, the highest military dignity in Britain, Germany, and other countries. George II. introduced the title into England when, in 1736, he created the Duke of Argyll and the Earl of Orkney field-marshals, but it had been long in use in the German armies, and is of German origin. In Britain the dignity is conferred by selection and enjoyed by but a very few officers, and chiefly for distinguished services or on the ground of royal descent. When not on active service, the field-marshal's pay is no higher than any other general, but when commanding an army he receives £16, 8s. 9d. a day, while a general has but £9, 9s. 6d.

FIELD-MOUSE. See MOUSE.

FIELD-OFFICERS, in the army, those competent to command whole battalions—majors, lieutenant-colonels, colonels, as distinguished from those intrusted with company duties, as captains, lieutenants, and ensigns.

FIELD OF THE CLOTH OF GOLD, a spot in the valley of Andren, between the English castle of Guisnes and the French castle of Ardres, celebrated for the meeting between Henry VIII. of England, and Francis I. of France, attended by the flower of nobility of both nations. The meeting took place on 7th June, 1520, and had been planned by Cardinal Wolsey, to enable the two kings to come to an understanding as to an alliance against Charles V. of Spain, whose recent election as German Emperor threatened to destroy the balance of power in Europe. The diplomatic results of the meeting amounted to but very little, as Wolsey had been bribed a short time previously by Charles, and the event is now memorable as a grand historic pageant in which the kings and nobles of France and England for three weeks endeavoured to outshine each other in gorgeous apparel, and all the pomp and circumstance of mimic war.

FIELD-PIECES, small cannons, from three to twelve pounders, carried with an army.

FIELD-WORKS, in fortification, are those thrown up by an army in besieging a fortress, or by the besieged to defend the place; as the fortifications of camps, highways, &c.

FIERI FACIAS, in law, is a judicial writ of execution issued on a judgment, by which the sheriff is ordered to levy the amount of the judgment on the goods and chattels of one party, for the benefit of another. See EXECUTION.

FIERY CROSS. See CRANTARA.

FIESCHI, GIOVANNI LUIGI DE', Count of Lavagna, a distinguished victim of unsuccessful ambition in the sixteenth century, was the head of one of the noblest houses in Genoa. He became master of a large patrimony at the age of eighteen, and being surrounded with dependents and flatterers, and really possessing considerable talents and eloquence, he was readily induced to aim at that power and distinction in the state which was then possessed by the family of Doria, headed by the famous Andrea Doria. The latter, whose patriotism and great qualities had justly raised him to the distinction of first citizen, being too intent upon the elevation of his nephew Giannetino, a youth of brutal and insolent character, a great degree of discontent was engendered among the nobles of Genoa, who, forming a party against Doria, willingly accepted a leader of the wealth and talents of De' Fieschi. The court of France, anxious to detach Genoa from the interest of the emperor, was easily induced to favour this enterprise, to which the concurrence of Pope Paul III. was also offered. Although Andrea Doria received some intimation of the design in agitation, De' Fieschi conducted himself with so much circumspection and apparent tranquillity that he could not be induced to believe aught to his prejudice. After several meetings the plan of the conspiracy was fixed, and the destruction of the Doria family formed an essential part of it. On the evening of January 1, 1547, De' Fieschi, who had prepared a galley under pretence of a cruise against the corsairs, waited upon Andrea Doria to request permission to depart from the harbour early in the morning, and took his leave with strong demonstrations of respect and affection. The same evening, however, he assembled a large body of his partisans at his house, on the pretence of an entertainment, to whom he made a warm and eloquent address; and, their concurrence being unanimous, he hastened to the apartment of his wife and acquainted her with his intention. She earnestly and in vain entreated him to abandon his desperate undertaking. While the city was buried in sleep he sallied forth, preceded by 500 armed men, and, despatching parties to different quarters, himself proceeded to secure the dock in which the galleys lay. He went on board one of these, from which he was proceeding across a plank to the captain galley, when the board gave way, and falling into the water, encumbered with his armour, he sank to rise no more. His confederates failed in their attempt on Andrea Doria, but Giannetino fell beneath their swords. The loss of their leader, however, proved fatal to the conspiracy; his brother Jerome was deserted, and the whole family paid the penalty of the ambition of their head by ruin and proscription.

FIESOLE (anciently *Fæsulæ*), a small town in the province, and 4 miles north-east of Florence, Italy, on the top of a steep hill, the front of which is cut into narrow terraces faced with stone; and its recesses, swells, and breaks covered with groves of pines, holly, and cypress, above which rises the dome of the cathedral. The town itself has little to boast of, being indebted for all its celebrity to its antiquity and happy situation. Under the name of Fæsulæ it was one of the twelve Etruscan cities. It submitted, with the rest of Etruria, to the Roman power, and was colonized by Sylla. In the commencement of the eleventh century it was destroyed by the Florentines, and a number of its inhabitants transported to Florence.

FIESOLE (so called from the monastery to which he belonged), one of the most celebrated restorers of painting in Italy. His family name was Santi Tosini. He was born, 1387, at Mugello, a district of the Florentine territory. In 1407 he entered the Dominican order, under the name of *Fra Giovanni da Fiesole*. He was also called *Angelico* and *Il Beato* (the Blessed), on account of his pious life and his

sacred pictures, in which grace and angelic beauty are the leading characteristics. He not only ornamented sacred books, but also executed large fresco paintings for his monastery. His industry was immense, and all the profits were expended in acts of benevolence. His merits were soon known and acknowledged. Cosmo de' Medici, who personally knew and loved the pious artist, employed him in painting the monastery of St. Mark and the church of St. Annunziata. In the monastery of St. Mark he adorned all the cells with large fresco paintings; and a fine Annunciation, among other paintings, is still discernible upon the walls. These pictures gained him so much celebrity, that Nicholas V. invited him to Rome, to ornament his private chapel in the Vatican, the chapel of St. Laurence, with the most important scenes from the life of this saint. Vasari relates the most striking anecdotes of the piety, humility, innocence, and purity of this master, which also show that he considered the exercise of his art as a most solemn and sacred employment. So scrupulous was he in the observance of the rules of his monastery, that the pope, perceiving how much his pious fasts and unceasing labour affected his health, gave him permission to eat animal food. He replied, with great simplicity, 'My prior has not granted me permission to do it.' Such was his submission, that he would undertake no work for other monasteries, or for private persons, without the consent of his superiors, to whom he always delivered the proceeds. He declined, with humility, the dignity of Archbishop of Florence, offered him by the pope, and which was bestowed at his request on Brother Antonino, who, he said, was more worthy of it. He died in 1455 at Rome, where he had painted the chapel of the Holy Sacrament in the Vatican, and was buried in the church Della Minerva. He has been beatified by the church. His only undisputed scholar whose works still remain, was Benozzo Gozzoli, whose numerous and well-preserved paintings are found in the Campo Santo in Pisa.

FIFE, a small military flute with but one key (often, however, with none). It has a compass of two octaves, and is of three sizes, named by the letters A B and C. The last is the highest in pitch, and is the one most commonly used.

FIFE, or FIFESHIRE, a maritime county, Scotland, forming the peninsula between the Firths of Forth and Tay. Extreme length, south-west to north-east 43 miles; extreme breadth, 17 miles, decreasing west to about 12 and 6 miles. Bounded S. by the Forth, N. by the Tay and the counties of Perth and Kinross; E. by the German Ocean; and W. by the county of Clackmannan and an isolated portion of Perth. The surface of the country is finely diversified by mountain, valley, and plain. The principal elevations are the Lomond Hills, whose highest summit is 1720 feet above sea level; Largo Law, 1020 feet; and Norman Law, 850 feet. There are, besides these, a number of lesser, though still considerable, eminences in various parts other parts of the county. The soil is of different kinds and qualities in different districts, but so productive that, in 1872, 240,636 acres, out of the total extent of 314,953, were under cultivation. The principal valley, called the 'Howe (hollow) of Fife,' watered by the Eden, is fertile, highly cultivated, and thickly studded with beautiful mansions and villas. Its entire length is about 10 miles; breadth, from 2 to 3 miles. But, perhaps, the most fertile tract is that lying along the shores of the Firth of Forth, exending inland from 1 to 3 miles, where the most luxuriant crops of corn, turnips, &c., are grown. The least productive, again, lies between the town of St. Andrews and the north-western parts of the county. The soil throughout this tract consists of a wet clay, and is, in general, cold and poor. There is also a good deal of barren land, composed of moss, moor, and rocky hill, in the western districts of the county, and along the shores of the Firth of Tay. In the higher grounds, and on inferior soils, oats are the principal crop; but, in general, all the most approved rotations are regularly followed out, and wheat, barley, beans, potatoes, and turnips are extensively cultivated. Cattle and sheep are reared in considerable numbers. Coal, iron, limestone, and freestone abound. The coal has been worked for several centuries, but the ironstone, especially that species of it known by the name of black-band, is a comparatively recent discovery. It supplies a number of blast-furnaces. The chief manufacture of the county is linen of different kinds, such as damasks, diapers, checks, ticks, &c. The first two are made principally at Dunfermline, the last two at Kirkcaldy. There are salmon fisheries on the Leven and Eden, and at Newburgh, and extensive herring fisheries along the north-east, east, and south coasts. Cod, turbot, haddock, and other sea fish are also taken in great quantities on the coasts. The number of towns and villages in this county is remarkable, the entire south and east coast being lined with them. The principal of the former are Dunfermline, Kirkcaldy, St. Andrews, Cupar, the county town, and Dysart. Fife contains sixty-one parishes, thirteen royal burghs, and a university, St. Andrews, the oldest in Scotland. It returns four members to the House of Commons—one for the county, and one for each of three districts of boroughs. Pop. 160,735.

FIFTH, an interval in music and the most perfect of concords, the octave alone excepted. Its ratio is 3 : 2. It is called the fifth as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic. See MUSIC.

FIFTH-MONARCHY MEN, a sect of politico-religious enthusiasts who sprang up during the Protectorate of Cromwell. They accepted a current opinion of the time that the four great kingdoms of Antichrist mentioned by Daniel, the Assyrian, the Persian, the Grecian, and the Roman were to be followed by the descent of King Jesus to reign for ever on the earth. They further believed that this advent was close at hand, supplementing it with the dangerous doctrine that physical force should be employed to pave the way for his reign. When the sect, who were of the extreme republican type, fancied Cromwell was aiming at the royal title as well as power, they raised a conspiracy against him (1657), which was quickly discovered. Their leaders were thrown into prison, and were only liberated on the death of the Protector. The sect became extinct shortly after the Restoration.

FIGEAC, a town, France, department Lot, beautifully situated on the right bank of the Célé, in the centre of an amphitheatre of wooded hills, vine slopes, orchards, and gardens, 32 miles E.N.E. of Cahors. It is an ancient place, owing its origin to a monastery erected by Pepin I. of Acquitaine, about 820, and consists chiefly of narrow crooked streets and antiquated houses with quaint Gothic fronts. The most remarkable objects are some remains of its fortifications, a town-house, which was once a feudal keep, and a church, which originally belonged to its abbey. The manufactures consist of linen and cotton goods, and there are several tanneries and dye-works, and some trade in wines and cattle. Champollion, the Egyptologist, was born here. Pop. 7610.

FIG-TREE (*Ficus carica*) is a native of Asia, Africa, and the south of Europe, and has been cultivated from remote antiquity in the countries surrounding the Mediterranean, where it forms a principal article of food in many places. It belongs to

the natural order Artocarpaceæ, sub-order Moreæ. The male and female flowers are mixed indiscriminately on the inside of a fleshy receptacle, which is concave in form, with its edges drawn together into a narrow opening. What are called the seeds in the ripe fig are the pericarps, each containing a single seed. The fig-tree is distinguished from almost all others by the extraordinary property of producing two crops of fruit in the same year on distinct shoots, in climates congenial to its growth. The shoots formed by the first or spring sap put forth figs at every eye as soon as the sap begins to flow again in July and August. These figs which form the second crop of the year ripen in their native climate during the course of the autumn, but rarely if ever come to perfection in England. The shoots formed by the second flow of sap, commonly called midsummer shoots, put forth figs in like manner at every eye, but not until the first flow of sap in the following spring. These last-mentioned figs, which form the first crop of each year, ripen in warmer climates during the month of June and July, but not in this country before September or October. The fig-tree, in its wild state, is a low, distorted shrub, bearing fruit destitute of any agreeable flavour. Dried figs are easier of digestion and more nourishing than the fresh fruit, and form a considerable article of commerce. The best come from Turkey, Italy, Spain, and Provence; those of the Archipelago are inferior in quality. Dried figs, with barley bread, are now the ordinary food of the lower classes in Greece and the Archipelago. The ancients procured a sort of wine from figs by a method which is still in use in the Archipelago. Several hundred varieties are cultivated in Europe, some of which are excellent. There are five principal methods of reproducing this valuable tree:—1. By seeds, which is but little employed on account of the length of time requisite for bearing, and the fruit is not always of as good quality; but it is the only method by which new varieties can be produced. The figs should be first washed in water, and those seeds rejected which float upon the surface. 2. The easiest mode is by suckers, which may be separated from the roots of the old trees. 3. In the month of March or April branches are passed through pots containing earth, which is occasionally watered to keep it moist; roots are produced with facility, and the branches may be separated in the autumn. 4. A method which requires less trouble and is most in use is the following:—In March or April a bough about 2 feet long and two years old is selected; the largest of its branches is reserved for the future stem, and the others are extended in the earth and give out roots; care should be taken to cover at least two-thirds of the bough with earth, otherwise the terminal shoot is not developed. 5. Grafting has been neglected on account of the facility with which the fig may be reproduced by these two last methods. When used a mixture of wax and turpentine is employed to prevent the flowing of the sap. This tree does not bear transplantation well, and consequently this is not often attempted. Almost every variety bears fruit twice in the season. For the process of *caprification*, as it is called, which is sometimes resorted to in order to increase the yield of the figs, see the article CAPRIFICATION.

The species of the genus *Ficus* are shrubs or trees, with alternate leaves and branches, and having a milky and more or less acrid juice, inhabiting the intertropical regions of the globe, a few species excepted, which are found in warm climates, though without the tropics. More than 100 species are known, the most remarkable of which are the following:—*F. sycomorus*, a large tree the fruit of which is eaten in Egypt and the Levant. The wood is said to be incorruptible, which would seem to be proved, as the cases containing the Egyptian mummies are made of this tree. *F. Indica* (*Urostigma indicum*) is the Indian fig or banyan tree, celebrated from antiquity from its letting its branches drop and take root in the earth, which, in their turn, become trunks, and give out other branches, a single tree thus forming a little forest. *F. elastica* (now called *Urostigma elasticum*), the juice of which, as well as that of some other species, yields *caoutchouc*, is a native of the mountains of Nepaul.

FIGUEIRA, a seaport, Portugal, province of Douro, at the mouth of the Mondego, 24 miles W.S.W. of Coimbra, with a harbour, which is defended by a fort, and safe when entered, though difficult of access. The trade, consisting chiefly of exports of salt, oil, wine, vinegar, dried fruits, and oranges, is considerable, and the town is visited during the bathing season by numerous visitors. Pop. 7000.

FIGUERAS, a town, Spain, Catalonia, in a plain 21 miles N.N.E. of Gerona. It consists of spacious and well-formed streets, and is defended by a fortress occupying a height north-west of the town, and possessed of great strength, though repeatedly taken by the French during the Peninsular war and in 1823. The principal buildings and establishments are an ancient parish church, a college, and several schools, a town-house, custom-house, theatre, barracks, civil and military hospitals. The manufactures are woollen and linen fabrics, leather, soap, corks, &c.; and the trade is in these and in grain, oil, wine, brandy, and liquors. Pop. 10,370.

FIGURAL (or FIGURATE) NUMBERS, an arithmetical amusement much in vogue at the beginning of the seventeenth century. Jac. Bernouilli, and particularly Wallis, in his Arith. Infinit., and L'Huilier in his Algebra, have made it a subject of investigation. These numbers are formed by the terms of arithmetical series of all sorts, in which the first member is always unity. For example:—

I.—1,	2,	3,	4,	5,	6, &c.
II.—1,	3,	6,	10,	15,	21, &c.
III.—1,	4,	9,	16,	25,	36, &c.
IV.—1,	5,	12,	22,	35,	51, &c.

Those in the second row are called *triangular* numbers, because their units may be arranged in pure equilateral triangles; the members of the third row are called *square* numbers; those of the fourth, *pentagonal*, &c.; and so there are also *hexagonal*, *heptagonal*, and, in general, *polygonal* numbers. If the terms of the polygonal series are again added, in succession, we obtain other orders, as the members of each of the rows are called; thus:—

a.—1,	3,	6,	10,	15,	21, &c.
b.—1,	4,	10,	20,	35,	56, &c.
c.—1,	5,	14,	30,	55,	91, &c.
d.—1,	6,	18,	40,	75,	126, &c.

are pyramidal numbers, because, by placing over one another the polygonal numbers in the order in which they are added, so that the smaller come over the next larger of the same sort, regular pyramids are formed. Thus the members of the row *a* form triangular, of the row *b*, quadrangular, and of the row *c* pentagonal pyramids.

FIGURANTES, those dancers of a ballet who do not dance singly, but many together, and serve to fill up the back-ground during the exhibition of individual performers. They correspond to the chorus in the opera. In the drama people are called *figurantes* who figure without having to say anything.

FIJI, FEEJEE, or VITI ISLANDS, an island group South Pacific Ocean, east of the New Hebrides, between lat. 15° 30′ and 19° 30′ S.; and lon. 177° E. to

178° w. The entire group, which comprises altogether 154 islands, sixty-five of which are inhabited, is subdivided into two minor groups, the Eastern and Asaua groups, the latter forming the west side of the Archipelago. There are numerous spacious outlets or passages to and from the central space, inclosed by the group known as the Goro Sea. Two of the islands only are of large size, namely, Viti Levu and Vanua Levu. The other principal islands are Vuna, Kantavu, Ovolau, Bau or Ambow, Muthuatu, and Goro; some of the others, though smaller, are populous. Most of the remainder are mere islets. They are of volcanic origin, but no signs of volcanic heat have been met with, excepting at Savu-Savu, on the south shore of the large island of Vanua Levu. Appearances of craters, however, are frequent. The peaks are usually basaltic cones or needles, some of which rise to the height of several thousand feet. A luxuriant foliage covers these islands to their summits, giving them a singularly pleasing and picturesque aspect. The coasts are almost surrounded with coral reefs, and where the shore is not precipitous the beach is formed of fine coral sand. The soil is generally fertile, consisting of a deep yellow loam, with a large admixture of vegetable matter. The cocoa-nut palm grows along the sea-coasts; the bread-fruit, banana, and pandanus are abundant; the orange, taro, yams, sweet-potato, maize, tobacco, and the sugar-cane are cultivated; timber trees, including the chestnut, are plentiful; sandal-wood was abundant, but is said to be now exhausted. The paper-mulberry furnishes a fibre, from which the natives manufacture fine cloth, which they also print. Swine, introduced by Captain Cook, are in general use as food, and fish are plentiful in the surrounding seas. The birds are wild-ducks, pigeons, the domestic fowl, parrots, and other tropical species. The inhabitants are given to agriculture, and inclose, dig, and irrigate their lands, using iron implements introduced by traders; the women perform most of the manual labour. They manufacture arrow-root and cocoa-nut oil. The houses are of various forms: some are built upon posts, and are of great size, occasionally 100 feet long and 40 feet wide, thatched with loose grass and without windows. The sexes sleep in separate houses. The houses are often neatly constructed, and surrounded with ornamental grounds very tastefully arranged. But the most remarkable structure is the *mbure* or spirit house, built on a raised and walled mound, and of uncouth proportions, being nearly twice as high as it is broad at its base, and having a singular sharp-peaked roof. In these structures certain deities are worshipped by priests called *ambati*. Of such structures each town has at least one, and often several. The towns are usually fortified with strong palisades, and have but two entrances, in which are gates, the passage being so narrow as to admit of only one person at a time. The native dress is scanty. The women wear a fringed band or apron made of the fibre of the paper-mulberry, which is tied on the right side, and is sometimes long enough to form a train. The men wear a kind of sash, also made from the paper-mulberry, white, brown, or figured. The sash passes between the legs, and is wound round the loins, one end fastened in front and hanging down over the knees, the other behind, or trailing on the ground. The hair is dressed in curious forms, and a gauze-like turban is worn. The mean temperature at Ovolau, one of the most beautiful islands of the group, about 8 miles long by 7 miles broad, during the six weeks that the observatory of the United States Exploring Expedition was established there, was 77° 81°. The barometer stood at 30·126 in. The lowest temperature was 62°; the highest 96°. The winds from April to November prevail from the E.N.E. to S.E., at times blowing a fresh trade-wind. From November to April north winds are often experienced, and in the months of February and March heavy gales are frequent, and generally last for two or three days. The climate is mild and vegetation very rapid in its growth; the temperature ranges between 62° and 80° Fahr. near the sea. In 1861 Dr. Seeman took out a quantity of sea-island cotton seed, which was sown on the 9th of June; on 18th October the plants were from 4 to 7 feet high, full of ripe pods and flowers; so that he was able to bring back to England, from which he was absent only thirteen months, a crop from the very seed he had taken out. But cotton, for the production of which the islands are remarkably well situated, had been previously introduced, though not then extensively cultivated, but it had spread itself in an almost wild state; it is now generally grown wherever Christianity is professed by the natives. The early character of the islanders was bad. They had deservedly the reputation of being cannibals, and cannibalism is even now not uncommon. In 1804 some convicts escaped from New South Wales to Viti Levu, and exercised no good influence upon the natives. The quarrels among the people became more frequent and sanguinary, and some of the defeated chiefs called in the aid of the natives of Tonga. The immigration of the Tongans had one good result: Christianity had been introduced among them, and a party of missionaries followed them to Fiji. Their efforts have done much good. Cannibalism has been greatly diminished, and polygamy also, and property is respected. The Bible has been translated into a dialect generally understood throughout the group, and many of the arts of Christian civilization introduced. The king is a Christian. In 1859, as a remedy against intestine disorders, and to avert aggressive demands made by the American government, the king offered to resign the sovereignty of the islands to the Queen of England. The English government, however, notwithstanding the earnest representations of 2000 European settlers, have not been desirous of undertaking the sovereignty or protectorate, and the king's offer, though subsequently repeated, still remains unaccepted. The Fiji group was discovered by Tasman in 1643. The pop. does not exceed 150,000.

FILANGIERI, GAETANO, one of the most celebrated political writers of the eighteenth century, who contributed much to the progress of legislation, was born at Naples in 1752. He was a son of Cæsar, prince of Araniello, and Marianna Montalto, daughter of the Duke of Fragnito. His family was of Norman origin, and one of the most ancient in the kingdom. Filangieri was the third son; and, his father not being very opulent, he was destined to the military service, which he entered in his fourteenth year, but which he soon after left, and devoted himself to study with such ardour, that notwithstanding the neglect of his early education, at the age of twenty he was well acquainted with the Greek and Latin languages, ancient and modern history, the law of nature and nations, and mathematics. Against the wishes of his family he commenced the practice of the law. His learning and eloquence soon made him distinguished. In a work against the favourers of the old system he successfully defended the reforms suggested by the spirit of the age and by reason itself, which Tanucci, then (1774) prime minister of Naples, was carrying into execution. Tanucci immediately became his patron, and Filangieri was soon appointed to stations of honour at the court, which did not, however, divert him from his favourite studies. He engaged in the preparation of a work which was to embrace the whole science of legislation; and as the

celebrated Beccaria, at Milan, had already published his essay on crimes and punishments, which formed a new epoch in criminal legislation, Filangieri intended to examine all the relations, and explain the fundamental principles of legislation in general. He executed this task with great depth of thought and soundness of judgment. He divided the work, La Scienza della Legislazione (The Science of Legislation), into seven books, of which the first, containing the general principles of legislation, and the second, treating of the principles of legislation in their application to political economy, appeared (1780) at Naples in two volumes. This work met with prodigious success, not only in Italy, but all over Europe; and the author, at the age of twenty-eight, was ranked among the most distinguished publicists. He speaks with boldness and independence of abuses; and although he exposes those of his own government, the king conferred on him the commandery of the royal order of Constantine. In 1783 he published the two next volumes, on criminal jurisprudence. This subject he treated in its whole extent, and exposed abuses or defects with the same freedom and boldness. His exposure of the evils of the feudal system and of the abuses in the church excited the fears of the high nobility and clergy, and his work was condemned by an ecclesiastical decree of Dec. 6, 1784, as tending to foster sedition and atheism. His only reply to the feudalists and curialists was the publication of the fifth, sixth, and seventh volumes of his work, which treat of education, morals, and public instruction. In 1783 Filangieri married Caroline von Frendel, daughter of a Hungarian nobleman, and governess of the second daughter of the King of Naples, and soon after retired, with the consent of his king, to a small town in the vicinity of Naples, to write, in the silence of the country, the last volume of his great work, which relates to religion as connected with the state. But his health had already suffered much, and he proceeded but slowly. The new king, Ferdinand IV., called him (1787) to his supreme council of finance. He was therefore compelled to return to Naples, and devote himself almost exclusively to his new duties. He soon after became sick, and died July 21, 1788, aged thirty-six. He had previously completed the eighth part of his work, on the religions that preceded Christianity. We find in it profound researches and spirited descriptions. Of the last book we have only the divisions of the chapters. This work has been often translated.

FILBERT, the fruit of the European hazel. See HAZEL.

FILE, a well-known steel instrument with small sharp-edged elevations on its surface called teeth, the use of which is to cut into or abrade metals, wood, ivory, horn, &c. Files are of various shapes, as flat, half-round, three-sided, square, or round, and are generally thickest in the middle, while their teeth are of various degrees of fineness and of different forms. Some files have their teeth formed of parallel ridges raised by a flat chisel, and are called single cut; or there may be two series of ridges crossing each other, when the files are called double cut. Files whose teeth are formed by a triangular sharp-pointed tool are properly called *rasps*. Single-cut files are used mostly for brass and copper, and have their teeth running obliquely across; double-cut files, on the other hand, are better suited for iron and steel. Rasps are used chiefly for wood and horn. The larger and coarser files are made from blistered steel of inferior quality; the finest files, for watch and clock making, from steel made from the best Swedish iron. The pieces of steel when brought into the shape of the file, but before receiving the teeth, are called 'blanks.' The flat and square blanks are formed by the hammer alone, the half-round and three-sided blanks are made by hammering them into a grove or die of corresponding shape. When the blanks are finished the file-cutter receives them for the purpose of cutting the teeth. Laying the blank on his anvil, and holding it in its place by means of leather straps through which his feet pass in the manner of stirrups, the workman strikes a blow on his chisel, which rests obliquely on the blank, and each blow raises a ridge or tooth. The strength of the blow depends on the hardness of the metal, and when one part is harder than another the workman alters his blows accordingly. The chisel is generally a little broader than the file, just long enough to be held easily between the fingers and thumb, somewhat as a pen is held, and is made of good tough steel. When one side is covered with single cuts, if the file is to be double cut he adds in the same manner a second series, crossing the others at a certain angle; and when one side is completely finished the next is begun, a flat piece of alloy of lead and tin being interposed between the anvil and finished side in order that the latter may not be injured. The round sides of files are also cut with straight-edged chisels, 'many rows of short cuts being made from the top to the bottom of the file, and these cuts uniting together at their extremities, thus form a complete series of lines passing completely round the cylinder or half-cylinder as the case may be. In fine round files as many as from ten to twenty rows of cuts are required to cover the surface with teeth; and when it is considered that there may be upwards of a hundred teeth within the space of an inch, some idea may be formed of the many thousand blows required to raise the teeth on a fine file' (Tomlinson). The files have to be hardened before they are fit for use, though those that are used for soft substances, as wood or ivory, do not require hardening. They are hardened by heating them to a cherry-red colour and then dipping them in water. Before they are inserted in the fire they are drawn through ale grounds or other adhesive fluids and then through pulverized salt, by which means they receive a coating that protects them from the direct action of the fire and the oxidizing influence of the air. The fusion of the salt also shows when the proper hardening heat is attained. The process of cutting causes the files to become slightly curved, a defect which has to be remedied before the hardening is completed. This is done by gradually heating them to a dull red and striking them with a leaden hammer on a leaden anvil. After the straightening and hardening the files are scoured with brushes dipped in sand and water, or powdered coke and water, every particle of salt is removed from them by letting them stand for some hours in lime-water, they are then thoroughly dried at the fire, and being rubbed over with olive-oil containing a little turpentine, are considered finished. Various file-cutting machines, more or less ingenious, have from time to time been invented, but they have not been perfectly successful, and cannot be said to have superseded hand labour to any extent.

FILE, in military science, the term for two soldiers, front and rear rank men. A company of twenty-five files thus contains fifty men.

FILIBUSTERS, a name given to those adventurers, chiefly from the United States, who endeavour to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, and said to be derived from *flibote* or *flibote*, a species of small fast-sailing vessel or clipper, much used by the West Indian buccaneers in the seventeenth century. After the termination of the last war between the United States and Mexico, piratical expeditions to the Spanish American terri-

tories became very frequent, and though prohibited by law, were nevertheless often supported by men of capital and influence, and hence winked at by the government authorities. Attempts were made to justify these proceedings on the plea of introducing the free and democratic institutions of the United States into countries which still groaned beneath the yoke of aristocratic tyranny. The real motives, however, were the love of adventure and excitement, and the still less justifiable ones of cupidity and self-aggrandizement. The most noted of the filibustering leaders was William Walker, who conducted an expedition against Nicaragua in 1855, and contrived both to make himself master of the country and maintain himself there for nearly two years. He was ultimately expelled by the union against him of the Central American states, and subsequently perished in an attempt to resume his piratical incursions. Another celebrated expedition was that of Lopez to Cuba in 1851, resulting in the overthrow and ignominious death of its leader and many of his associates. An expedition of the filibustering kind to Cuba took place so recently as 1873. The capture of the *Virginius*, an American steamer, carrying men and material to assist the insurgent Cubans, and the execution of a number of those taking part in the expedition by the Cuban authorities, in November of the above year, threatened for a time to produce a serious misunderstanding between Spain and America.

FILICAIA, VINCENZO DA, an Italian poet of the seventeenth century, who successfully opposed the torrent of bad taste which was corrupting the poetry of his native country. He was born in 1642 at Florence, where he began his studies in the Jesuits' College, and afterwards studied at the University of Pisa. His first poetic attempts were verses to his mistress; but deprived of the object of his love by her early death, he resolved never again to sing of a passion, the pleasures of which, he supposed, were vanished from him for ever, and determined to devote his lyre to sacred or heroic subjects. On his return to Florence he was chosen member of the Academy della Crusca, and soon after he married the daughter of a senator, Scipio Capponi, with whom, after his father's death, he retired to the country, and devoted his whole attention to the education of his children and the ease which he loved so well. In this retirement he wrote a great number of Italian and Latin poems; but as his modesty led him to find more fault with them than did the few friends to whom he showed them, they remained unpublished; and he would probably have continued to conceal his splendid talents had not his friends at length revealed the secret. Filicaia had celebrated, in six odes, the deliverance of Vienna from the Turks, by John Sobieski, king of Poland, and the Duke of Lorraine, and the entire defeat of the Turks, which happened soon after. These odes were so much admired that the Grand-duke of Tuscany sent them to those princes. They were printed at Florence in 1684, and Filicaia's fame was thus established as the first poet of his time in Italy. His fortune, however, was little improved by this accession of fame. Queen Christina of Sweden first interested herself in relieving the poet, appointed him a member of the academy of distinguished men which she had founded at Rome, and charged herself with the education of his two sons, on condition that it should not be made known, because she was ashamed to do so little for so distinguished a man. The attention of the Grand-duke of Tuscany was afterwards turned towards him, and one of his sons, who, however, soon died, was received into his service as page. Filicaia was then appointed by him senator and governor of Volterra, and afterwards of Pisa. In the discharge of these offices he gained the love of the people and the esteem of the sovereign; and notwithstanding the multiplicity of his occupations, he always found time to devote to his favourite studies. His advanced age, and the loss of several of his children, turned his whole thoughts to religious subjects. He undertook, however, the publication of a revised edition of his complete works, but died at Florence, Sept. 24, 1707, at the age of sixty-five. His son Scipio published the collection begun by his father, under the title of Poesie Toscane di Vincenzo da Filicaia, and dedicated it to Cosmo III. Another edition, with the life of the poet by Tommaso Bonaventuri, appeared in 1720, and a third, in two volumes (Venice, 1762), which the later editions have followed. Filicaia was particularly successful in the canzoni, and in some of his sonnets;—that, for instance, which begins,

> 'Italia, Italia, o tu cui feo la sorte
> Dono infelice di bellezza, &c.,'

is one of the finest poems of the sort, and may sustain a comparison with the best lyric productions.

FILIGREE (or FILLIGREE) WORK, a kind of ornamental work in gold or silver, wrought delicately, in the manner of little threads or grains, or of both intermixed. Several specimens of Byzantine work still exist, such as the cross given by the Emperor Lothaire to the treasury of Aix-la-Chapelle. At Venice, and in several of the French and German towns, elegant specimens of this delicate art were manufactured as early as the twelfth century. In the seventeenth century the art was carried to its highest perfection in Italy. In Sumatra manufactures of this kind are produced of exquisite design and workmanship, though the tools made use of are very coarse and clumsy. The workmen melt the gold in a crucible of their own forming, and, instead of bellows, they blow with their mouths through a piece of bamboo. They draw and flatten the wire in a manner similar to that adopted by Europeans. A pattern of the flowers or foliage is prepared on paper, of the size of the gold plate, on which the filigree is to be laid. According to this they begin to dispose on the plate the larger compartments of the foliage, for which they use plain flat wire of a larger size, and fill them up with the leaves. A gelatinous substance is used to fix the work, and, after the leaves have been placed in order, and stuck on bit by bit, a solder is prepared of gold-filings and borax, moistened with water, which is strewed over the plate; and after being put into the fire a short time, the whole becomes united. When the filigree is finished it is cleansed with a solution of salt and alum in water. The Chinese make most of their filigree of silver, which looks very well, but has not the extraordinary delicacy of Malay work.

FILIPO D'ARGIRO, SAN, a town in Sicily, Italy, in the province of Catania, and 31 miles W.N.W. of the town of that name, near the centre of the island, on a height crowned by a Saracenic castle. This town (the ancient Agyrium), the birth-place of Diodorus Siculus, is noted for the remains of splendid aqueducts. Saffron of good quality, and in great quantity, is grown in the neighbourhood. Pop. 11,616.

FILLAN, ST. Two saints of this name appear in the church calendars.—1. ST. FILLAN, or FAOLAN, the leper, whose annual festival is the 20th June. His principal church in Scotland was at the lower end of Loch Erne, in Perthshire, where 'St. Fillan's Well' was long believed to have wonderful healing properties. In the rock of Dunfillan is a seat known as St. Fillan's Chair, and two cavities beside it are said to have been hollowed out by the saint's knees in prayer. His Irish church is at

Ballyhayland (anciently called Killhelan, or Kill-Faelain), in the barony of Cullenagh, Queen's County.—2. ST. FILLAN, the abbot, son of St. Kentigerna, of Inchcaileoch, in Loch Lomond, flourished in the eighth century. His festival is on the 7th or 9th January. His chief church in Scotland was in Perthshire, in Strathfillan, the upper part of Glen Dochart. A linn in the river Fillan, or Dochart, was believed to work miraculous cures on the insane. The silver head of his crosier is still in the hands of the family it had been intrusted to by King Robert Bruce. This relic, called the Coygerach, or Quigrich, was believed to have special healing virtues, and was infallible in detecting theft.

FILLANS, JAMES, an eminent Scottish sculptor, was born at Wilsontown, Lanarkshire, on 27th March, 1808. While he was still a child his father removed to the county of Renfrew, where he was set to work as a farmer's boy, and never received anything beyond the most rudimentary instruction. He was afterwards apprenticed to a weaver in Paisley, and then, disliking that employment, to a stonemason. At this occupation he worked for some time as a journeyman. For a long period he had assiduously cultivated during his spare hours his genius for drawing and modelling, and under the encouragement of Motherwell the poet, then editor of the Paisley Advertiser, he now commenced life as a sculptor. After acquiring some local celebrity in Paisley by his portrait busts, he proceeded to Glasgow, where he speedily acquired a more extended reputation. He subsequently visited Paris to improve himself in his art, and on his return took up his abode in London in 1836. To the Royal Academy exhibition of 1837 he furnished seven busts, including one of Allan Cunningham. His next works were an alto-rilievo representing the birth of Burns, a Tam o' Shanter jug, and other designs from Burns' poems, which were much admired. A commission which he received from the tenantry of Mr. Oswald of Auchincruive to execute a bust of their landlord, then in Italy, led to his making a journey to that country. A life-size group in marble, the Blind Teaching the Blind, was exhibited by him in Glasgow, and produced a great sensation. Other admirable works of his are the Boy and Fawn, the statue of Sir James Shaw, erected in Kilmarnock, and the bust of Professor Wilson. In 1851 he removed from London to Glasgow, but being now in a failing state of health, died there of rheumatic fever on 12th September of the following year. He left unfinished a colossal statue of Rachel Weeping for her Children. A life of the sculptor was published by James Paterson at Paisley in 1854, in a handsome quarto, containing drawings of his principal works.

FILLET, a small flat band or face, used chiefly to separate mouldings from each other in classical architecture; in Gothic architecture, used also on larger mouldings and shafts.

FILTRATION. This term is properly applied only to the separation of solid matter in suspension in a fluid by passing the fluid through a substance the pores of which are sufficiently small to prevent the passage of the solid particles. Solid matter in *solution* is not usually retained under those circumstances, but even this kind of filtration can be also effected to a greater or less extent. The materials of which the filter is composed depend on the kind and quantity of substance to be filtered. In the laboratory, where filtration is commonly employed to separate small precipitates or crystallizations from fluids, fine white blotting-paper, freed from mineral matter by washing with dilute acid and then with distilled water, is used. A circular sheet of the paper is cut, then doubled upon itself, and the [illegible]-shaped piece again doubled. On opening this [illegible] cone of paper is obtained, with three folds of the paper on one hand and a single fold on the [illegible] This is fitted into a glass funnel, moistened, and [illegible] fluid poured on. Ribbed or creased filters are [illegible] employed. Paper, however, cannot be used [illegible] the fluids are strongly acid or alkaline. When [illegible] is the case cloth, fine sand, pounded or spun [illegible] asbestos, porcelain, are found convenient. Cotton [illegible] a very good filter for oils or ethereal solutions of [illegible] oils and fats.

On the large scale filtration is specially applied [illegible] the purification and aeration of water. The filters [illegible] water-works are large tanks or beds, made of [illegible] clay and filled with layers of large stones, pebbles [illegible] and coarse gravel, fine gravel, coarse sand and [illegible] sand—the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell-sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. On the small scale water is often filtered in small stone filters containing porous earthenware filtering-stone, or sand; but glass filters have also been introduced, the porous material being gas-carbon or coke. In the refining of sugar the syrup is twice filtered—1st, through long bags, which are woven without seam expressly for the purpose, to remove mechanical impurities, sand, clay, wood, &c.; 2d, through beds, several feet thick, of animal charcoal (BONE BLACK), contained in large iron cylinders, to remove the brown colour. This second filtration is different from the other in so far as the colouring matter is not a suspended solid, but is in solution. Charcoal is highly prized for its decolorizing properties, but it is only one manifestation of the great tendency which it has to absorb substances, whether gaseous, like sulphuretted hydrogen, or solid in solution, like colouring matters, alkaloids, &c. Filtration is applied in various pharmaceutical operations, as in the clarification of oils. Of course after a time the filter becomes choked with the retained matter, and must be either cleaned or renewed. The sand in a water-filter requires renewal in a few weeks or months, according to the purity of the water; animal charcoal is well washed after every charge of syrup, dried, and reignited; paper filters can be used only once; and cloth filters or woollen bags, such as those for clarifying jellies, must be thoroughly cleansed both to take out the impurities and to prevent the fluid acting on the material of the bag, or decomposing and giving it a bad smell. Filtration is sometimes a rapid, but more frequently a tedious operation, as when the solid matter is glutinous and chokes up the pores. To overcome this various devices are resorted to, all of them tending to increase the difference of pressure on the two sides of the filter. Thus a siphon, to the shorter limb of which a funnel covered with cloth or paper is attached by the neck, facilitates the passage of the fluid by the difference of hydrostatic pressure; or a tube may be bent twice at right angles, one end furnished with a covered funnel and the other inserted air-tight into a flask containing a little water. By boiling the water briskly the air is expelled, and if, when so boiling, the funnel be immersed in the fluid to be filtered, and the flask be cooled, the condensation of the steam produces a vacuum, and the fluid passes over rapidly to the flask, the solid matter being checked by the cloth or paper diaphragm. The most recent, and perhaps the most

universally applicable, is that proposed by Bunsen, of which various modifications have been devised. It consists in inserting the glass funnel—which must be accurately sloped to 60°, and which is furnished with a little platinum cone, to give strength to the apex of the filter—air-tight into a stout flask, by means of an india-rubber stopper, through which also passes a piece of glass tube connected with an exhausting arrangement, an air-pump, Sprengel's mercury-pump, or Bunsen's or other water-pumps. By exhausting the air from the flask atmospheric pressure hastens the passage of the fluid, and in this way filtrations can be effected which are in ordinary circumstances impracticable. Not only so, but the washing of the solid matter on the filter can also be more efficiently performed in a shorter time and with a smaller quantity of fluid than by the common method.

FIN. Fishes are provided with certain members or appendages, whose use is to propel them rapidly through the fluid medium in which they live. These members are denominated *fins* or *pinnæ*, and consist of bony, cartilaginous, or membranaceous rays, supported and held together by an interradial membrane, mostly of a very delicate substance. In some kinds of fish the thick skin which covers the body invests the fins also, rendering the presence of rays evident only by trifling ridges, as in the shark and ray genus. Fishes, in general, possess five kinds of fins, which are divided into two groups, paired fins, the pectorals and the ventrals; and mesial fins, the dorsal, anal, and caudal fins. The paired fins are homologous with the limbs of the vertebrates, the pectoral corresponding to the anterior or upper, the ventral to the posterior or lower limbs. The mesial or vertical fins are placed in the middle line, and do not represent limbs: they have no counterpart save in the mesial fold of integument in newts and tadpoles:—1. The *pectoral* or breast fins are never more than two; they are placed immediately in the rear of the gill, opening on the shoulder. In a state of rest these fins are parallel with the body, and the apex towards the tail. 2. The *ventrals*, or abdominal fins, are placed under the throat or belly, and point backwards. They are smaller, in general, than the pectorals, and have sometimes long appendages, as in the *Osphronemus* or *goramy*. In the gurnard pectoral appendages also occur. 3. Those of the back, which are therefore denominated *dorsal*, varying in number from one to four, to which sometimes are added several finlets or *pinnulæ*—small appendages which are seen in the mackerel. 4. The *anal* fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. Lastly, 5. The *caudal*, or tail fin, terminating the body, and serving as the rudder by which the fish steers itself. By means of the dorsal, anal, and ventral fins, the body of the animal is sustained in a vertical position in the water, while the pectorals and caudals are used in propelling it forward; in which it is also aided by the action of the tail. Naturalists have availed themselves of the position of the fins to construct divisions in the class of fishes, and minor characters are drawn from the substance of the fins, whether soft, spiny, or both, as is the case in the majority of fishes. Attached by interspinous bones to the spines of the vertebræ, the fins possess great power. The muscles which move them are very strong, and by a peculiar arrangement they are enabled to erect the spines immovably at will, which is observed when fishes are taken by the hook. Sometimes spines occur separate from the fin, as in the *Gasterosteus*, or stickle-back. Severe wounds are inflicted by the spiny processes of the fins of fish, and poisonous effects are attributed to many of them, although without much ground. In the case of the sting-ray and a few others, the dangerous wounds which have been received by incautious fishermen abundantly testify to the serious effects of a venomous fluid secreted by the skin. In the *Exocetus*, or flying-fish, the pectorals are enlarged sufficiently to serve as wings, by which the animal sustains itself for several seconds in the air. In the suckers, or *Cyclopterus*, the ventral fins are united in a circular disk, or sucker, by which the fish attaches itself to rocks very firmly. Perhaps the most singular use to which the whole set of fins is applied occurs in the climbing-perch, a fish, which, in the most extraordinary manner, leaves its native element, and, by means of the spinous portion of its fins, absolutely ascends the trunks of trees several feet, and conceals itself in the collections of water at the base of the leaves of certain palm-trees. In colour and size the fins of fish present the greatest variety, affording excellent characters for distinguishing the species. For the arrangement depending on their number and position, see ICHTHYOLOGY.

FINALE, the concluding part of a musical composition; for instance, of a quartetto, of a symphony, of any act of an opera, of a ballet, &c. It consists of compositions of various characters. The finale, in instrumental pieces, has mostly a character of vivacity, and requires a quick movement and lively performance. In the opera the finale usually consists of a series of compositions for many voices, and of different character and different time and movement.

FINCH. This numerous family of birds embraces not only some of the most beautiful, but also some of the most agreeable of the feathered tribe. It forms the genus *Fringilla* of Linnæus, which has since been much subdivided by modern ornithologists.

Among the most celebrated is the goldfinch (*Carduelis elegans; F. carduelis* of Lin.) This is the most esteemed of the hard-billed birds, for the colours of its plumage, the elegance of its form, and the harmony of its notes. The bill is white, tipped with black, and surrounded at the base with a ring of rich scarlet feathers. The head is covered with large spots of black and white; the back, rump, and breast are of a pale, tawny brown. When the wings are folded they display a row of white spots, finely contrasted with the black ground on which they are placed. These are the tips of the wing-feathers, which terminate in white. This bird is a native of Europe, where it remains during the winter. It begins its warbling about the beginning of March, and continues melodious throughout the whole spring. In winter it assembles in large flocks, and feeds upon seeds of different kinds, particularly those of the thistle. It prefers orchards as a residence. The nest is an intricate but beautiful structure, the outside being composed of moss, lichen, and coarse grass, lined with hair, wool, and swallow down. The female goldfinch will sometimes pair with the canary. The females lay five white eggs, marked with spots of a deep purple colour at the larger end. They feed their young with caterpillars and insects. When kept in a cage they will sing the greatest part of the year. In a state of confinement they become very docile, and can be taught a variety of little tricks.

The canary-bird (*F. canaria*) is the most remarkable and melodious of the finch tribe, and, next to the nightingale, has been most celebrated for its musical powers. In a wild state it is chiefly found in the Canary Islands, but has become so common in a state of captivity that its native habits and country have been almost forgotten. It is uncertain at what period these birds were introduced into Europe, but probably not till about the fourteenth century. Belon, who wrote in the sixteenth, makes no mention

of them. Gesner and Aldrovandus speak of them as so great rarities that they could only be purchased by people of high rank. They are now bred in great numbers, and have become so common that they are of little comparative value. More than twenty-seven varieties were enumerated before 1718, and by careful selection a still larger number now exists; but the majority of the differences are in colour and markings. The Belgian variety differs, however, also in form, being even 3 inches longer in the body than the wild bird, which is 5 inches long. In their native state they are of a dull and uniform green, and exhibit none of that richness and variety which are so much admired in the tame ones. Hybrids have been obtained by crossing with at least nine other finches, and 'several of them are almost completely fertile; but we have no evidence that any distinct breed has originated from such crosses.' Like the rest of the finch tribe they have a high, piercing note, which they continue for some time in one key without intermission, then raise it higher and higher by degrees. This note is variously improved by education; for this bird, being more easily reared than most others, and continuing its song much longer, has had much attention paid to it. Numbers of treatises have been written on the rearing and education of these birds, which we have not space to analyze. Let it suffice that in Germany and the Tyrol, from whence the rest of Europe is principally supplied, the apparatus for breeding canaries is both large and expensive. A large building is erected for them, with a square space at each end, and holes communicating with these spaces. In these outlets are planted such trees as the birds prefer. The bottom is strewed with sand, on which is cast rape-seed, chickweed, and such other food as they like. Throughout the inner compartment, which is kept dark, are placed brooms for the birds to build in, care being taken that the breeding birds are guarded from the intrusions of the rest. Tyrolese dealers usually bring over to England about 1600 of these birds; and though they carry them on their backs nearly 1000 miles, and pay £20 for them originally, they can sell them at 5*s.* each.

Linnet (*Linota cannabina*).—This plain but melodious little bird is common to all parts of Europe. It is about 5½ inches in length, of a dark reddish-brown colour on the upper parts, and a dirty reddish-white beneath. It builds its nest in low bushes; the outside is made of dried grass, roots, and moss, lined with hair and wool. The female lays four or five eggs, of a pale blue colour, spotted with brown at the larger end, and generally breeds twice in the year. The song of the linnet is sweet and varied; its manners are gentle and docile; it easily adopts the song of other birds when confined with them, and, in some instances, has been taught to pronounce certain words. It is frequently found in large flocks, and during winter feeds on various kinds of seeds, but more particularly on the linseed, from which circumstance it derives its name.

The following is a brief outline of the finch family as that term is now used, and though almost every writer has his own classification, the reader will see the general relations of the group:—Family *Fringillidæ*. Sub-family *Emberizinæ*, the Buntings. Sub-family *Loxiinæ*, the Crossbills. Sub-family *Pyrrhulinæ*, the Grosbeaks. Sub-family *Fringillinæ*, under which sub-family are included: 1, *Coccothraustes*, the Green and Haw Finches; 2, *Fringilla*, the Finch proper with its sub-genera: *a*, *Carduelis* (*C. elegans*, Goldfinch; *C. spinus*, Siskin); *b*, *Linota* (*L. cannabina*, Common Linnet; *L. linaria*, Lesser Redpole; &c.) *c*, *Citrinella*, Citril Finch; *d*, *Fringilla* (*F. cælebs*, Chaffinch, &c.); *e*, *Montifringilla*, Mountain Finch or Brambling. 3, *Passer*, Sparrows. Sub-family *Spizellinæ*, an American group, the Bunting Finches, as the Tree Bunting Finch (*Spizella*); the Prairie Bunting Finch (*Passerculus savanna*), and the Shore Finches (*Ammodromus*). Sub-family *Pitylinæ*, or Parrot Finches, also chiefly an American group, under which come the Reed Finches (*Donacospiza*). The Virginian Cardinal Finch (*Cardinalis virginiensis*).

FINCH, Heneage. See Nottingham (Earl of).

FINDEN, William, a celebrated engraver, born in 1787, was originally bred to the occupation of engraving shop-bills, cards, and similar matters; but having cultivated a taste for the higher departments of art, became famous as a book illustrator, one of his first successes being his engravings of Smirke's illustrations of Don Quixote. In partnership with his younger brother Edward he commenced the publication of several extensive series of engravings, the first and most successful of which was the Byron Gallery. Other series followed, including the Gallery of British Art, 1838–40. It however proved a most disastrous undertaking, from the expensive scale on which it was carried on, depriving him ultimately of all the profits which he had amassed by his former labours. Though he still laboured diligently at his profession, his spirit was broken, and he accomplished no further work of distinguished merit. He died on 20th September, 1852. Besides his book-plates, Finden has produced some celebrated large engravings, among which may be mentioned his Village Festival and Highlander's Return, from Wilkie's pictures, and a portrait of George IV., after the picture by Sir Thomas Lawrence. For this last he received the sum of 2000 guineas.

FINE (probably from Latin *finis*), in English law, formerly signified 'an income or a sum of money paid at the entrance of a tenant into his land; a sum paid for the renewal of a lease; and an assurance by matter of record founded on a supposed previously existing right. In every fine which was the compromise of a fictitious suit, and resembled the *transactio* of the Romans, there was a suit supposed, in which the person who was to recover the thing was called the plaintiff, conusee, or recognizee, and the person who parted with the thing the deforceant, conusor, or recognizor. It was termed a fine for its worthiness, and the peace and quiet it brought with it' (Wharton's Law Lexicon). Fines upon land were abolished by 3 and 4 Will. IV. cap. lxxiv. (For the origin and purpose of the statute of fines see Hallam's Constitutional History of England, vol. i. ch. i. Besides the specific uses above referred to, fine has the signification in general law of a pecuniary penalty exacted either in punishment of, or in compensation for, an offence, whether committed against an individual, in contravention of the laws of the community, or against the community itself. Fines in this sense are of very ancient origin, and have been sanctioned by the practice of all nations, ancient and modern, from the lowest to the highest degree of civilization.

In the earlier stages of society fines form, for an obvious reason, one of the principal modes of punishment. Prisons and artificial restraints impose a burden on society which it is not yet able to bear, and demand an organization which it has not reached. There remain only fines, corporal chastisements, and death. The last is suited only for the gravest offences; the second is rendered impracticable in the case of many offences by the dignity of the offenders; the first in many others by their impecuniosity. Hence arises, at a very early stage of social development, that distinction so often complained of as a later corruption, of one law for the rich and another for the poor, the latest form of which is the modern alternative of fine or imprisonment. The practice of imposing fines in commutation even of the pain of death

has been found in rude societies too frequently, and under too many diversities of circumstances, to admit of its being referred to anything but the common necessities of their situation, and the influence in such societies of powerful individuals or classes.

In the most civilized nations of antiquity, Greece and Rome, fines were numerous and frequently excessive. Miltiades, the hero of Greece, being intrusted after the battle of Marathon, at his own request, with seventy ships for a secret purpose, attacked the island of Paros, where he is said to have had a private revenge to gratify, but was repulsed and compelled to return to Athens without accomplishing his object. Being impeached by Xanthippus, and condemned for deceiving the people, the penalty was commuted to a fine of fifty talents, the cost of the equipment of the fleet with which he had been intrusted. The fine was paid by his son Cimon. In the early period of the existence of Rome fines were imposed in cattle, the highest amount of the mulcta or damnum being two oxen and thirty sheep; when coined money came into use, an ox was valued at 100 asses (see As) and a sheep at 10, so that the maximum fine would amount to 500 asses. The estimation of fines in cattle was continued down to the time of Trajan, but their maximum limit was extended. The ancient Germans, being a people who highly valued freedom, admitted hardly any punishment but fines, and their influence extended the use of this penalty among other European nations. A murder was commuted by a payment to the family of the deceased. In the ancient French law fines were divided into two classes, according as they were fixed by law or left to the discretion. This distinction has been abolished since the revolution by the fixing of maximum and minimum limits for all fines.

In England the common law recognizes fines, but does not determine their amount, and this is usually fixed in particular statutes, with a discretion to the judge. The rule in England from an early period, and which was incorporated in Magna Charta, was that no man should be amerced beyond his circumstances and personal estate, leaving to the landowner his land, to the merchant his stock, and to the husbandman his wainage or team and instruments of husbandry. This rule was not always observed, and we have in the Bill of Rights (which see) a stipulation that excessive fines shall not be imposed. The recovery of fines in Great Britain is provided for by Act 32 and 33 Vict. cap. xlix., passed 2d August, 1869.

FINE ARTS. See ARTS, and the different articles on the various branches of the fine arts.

FINGAL. See OSSIAN.

FINGAL'S CAVE. See STAFFA.

FINGER-BOARD, the part of a stringed instrument, as the neck of a violin, guitar, &c., to which the fingers (of the left hand) are applied in playing to stop the strings. The finger-board of a keyed instrument (played with both hands) is commonly called a *key-board*.

FINGERING, disposing of the fingers in a convenient, natural, and apt manner in the performance of any instrument, but more especially of the organ and pianoforte or harmonium. Good fingering is one of the first things to which a judicious master attends. It is, indeed, to this that the pupil must look as the means for acquiring a facile and graceful execution, and the power of giving passages with articulation, accent, and expression. The following remarks apply especially to the pianoforte. Good fingering may be said to consist in two parts, the holding of the hands and fingers in the right position over the keys to give due command both of fingers and wrists in execution, and the proper disposition of the fingers upon the notes to facilitate movement from one position to another. The former of these will probably be thought by the uninitiated by much the easier of the two; it is in reality the more difficult, and so far from being a merely initiatory part of the art, it is one to which the attention of the pupil, throughout his progress, must be incessantly directed. It implies the power of recovery—that is, of withdrawing each finger from the note into its normal striking position, for it is evident that if there is a position of the fingers which in beginning to play facilitates the reaching of the notes, the same position, allowing for the movement of the hands along the key-board, will facilitate it throughout. Nothing, however, is more common than the violation of this rule. Performers of considerable experience may be seen with their fingers flying about in a way that makes it wonderful, even to a casual observer, how they ever reach the notes at all. The cause of this is easily explained. In striking, the position of the hand is disarranged. When the third finger, for example, is pushed against a note, the muscular action causes the fourth to fly into the air, when the second is struck the third and fourth fly up, and so on. A smooth and even style, which is the groundwork of all artistic expression, can never be acquired in this mode of performance. The hand must be held evenly over the key-board, with all the fingers curved by bending both the first and second joints, so as to bring the points of the fingers nearly perpendicularly over the notes, and not at too great a distance. The hand may be more or less spread, according to the nature of the passage. This is the normal position. In striking the notes the power must be acquired of moving each finger independently, so that whatever notes may be struck the remaining fingers may retain their normal position. The force of the stroke comes from the partial straightening of the finger in striking, and especially in striking chords, from the action of the wrist. In striking a chord repeatedly and rapidly the striking fingers should, after the first stroke, be held immovable, and the action of striking be given entirely from the wrist. The stroke should be given with the fleshy tip or front of the finger, in which the sense of touch is most acute, and to secure this the nails should be kept short. In leaving the note, to secure a proper recovery, the fingers must be lifted from the knuckle-joint, while the first and second joints are employed in recovering the normal position. This must commonly be done simultaneously with the striking with other fingers. A full-grown hand can usually strike an octave while holding the thumb and fourth finger slightly curved, which should always be done, the intermediate fingers being still kept bent and slightly elevated, so as not to interfere with the free action of the hand. In moving the hand in running passages the thumb is passed under the second or third finger. This will be found in elementary books of instruction, and it is only mentioned here to say that the thumb must be well pressed in to reach its position freely, and as soon as the second or third finger is released the hand must be rapidly and smoothly passed to its new position. A good action of the hands depends very much on a careful attention to this turning movement. Indeed all the fingers must in turn be made fixed pivots on which the position of the hand may turn, and should be so used that the striking finger may be brought directly over the note to be struck. The knowledge of any mechanical art depending on muscular exertion will greatly facilitate the progress of the pupil in learning fingering. Those who possess this knowledge will understand that attitudes and movements at first apparently impracticable are, when the necessary muscular freedom has been

acquired, the most easy, free, and natural. The acquisition of the combinations of fingering is purely a matter of mechanical knowledge. They are very varied and extensive, and it requires considerable time to master them, but there is at the present day no impracticability in a pupil's doing this without tutorial assistance. If the *art* of fingering can be acquired thus, the *knowledge* of it certainly may. Elementary treatises may be had in abundance, which explain its first principles; and a sufficient number and variety of pieces, fingered by competent masters, can be procured to form the judgment of the pupil, and enable him to act independently.

FINGERS AND TOES, a disease or malformation in the bulb of the turnip, which, instead of swelling, throws out various knobby appendages. It generally arises from some peculiarity of the soil, which is not well mellowed, or from injudicious cropping. It does not appear that insects are in any way the cause, although the divided roots, when they rot, are not unfrequently filled with various species which live in putrescent substances.

FINIAL (architecture), the bunch of foliage which terminates pinnacles, canopies, pediments, &c., in Gothic architecture.

FINING. See CLARIFICATION.

FINISTÈRE, or FINISTERRE (Land's End), a department of France, so named from occupying its westernmost extremity; bounded E. by the departments Côtes-du-Nord and Morbihan, and on all other sides by the sea; area, 2595 square miles. The coast line is bold and precipitous, composed almost throughout of lofty granite cliffs, in which the violence of the waves has made numerous deep indentations, the two most important of which, both on the west, form the extensive bay of Douarnenez and the famous roadstead of Brest. The interior is traversed by two chains of hills; the more northern called Mount Arré, the other chain known by the name of the Montagnes Noires or Black Mountains. These chains send out numerous ramifications, which extend in all directions, and give the whole department a very hilly appearance. In some parts it looks bleak and desolate, as in the arrondissement Châteaulin, where are those extensive tracts, almost barren, known by the name of Landes; but in many other parts the scenery is rich, and beautifully diversified. The number of streams is very great; but the only navigable rivers are the Aulne, Elora, and Odet. An important addition to the water communication is the canal which connects Brest with Nantes. The climate is more equable than that of the interior of France, the range of the thermometer being much more limited. Winds, more or less west, blow during three-fourths of the year, and often with great violence. Owing to the rocky nature of the surface scarcely one-half of the whole is available for cultivation, and much more than one-third is waste. The arable land, however, is of good quality, and well cultivated; and a considerable surplus of grain is left for export. The principal crops are wheat, rye, and oats. Potatoes and flax are also extensively grown, and from the produce of the orchards a good deal of cider is made. The domestic animals are generally of good breeds. The fisheries on the coast are extensively carried on, and that of sardines is particularly valuable, employing a great number of hands. The minerals are of considerable importance, including iron, zinc, bismuth, and lead. The mines of the last, at Poullaouen and Huelgoat, are considered the most productive in France. The manufactures consist chiefly of sailcloth, ordinary linen, soap, oil, candles, ropes, leather, paper, and tobacco. Ship-building also is carried on to a large extent. The trade, greatly favoured both by internal communication and a number of good harbours, is extensive. For administrative purposes the department is divided into five arrondissements—Quimper, the capital; Brest, Châteaulin, Morlaix, Quimperlé; subdivided into forty-three cantons, and 282 communes. Pop. (1872), 642,963.

FINISTERRE, CAPE (Latin, *Promontorium Celticum*), the most western cape of Spain, on the coast of Galicia, 42° 54′ N. lat.; 9° 21′ w. lon. The highest peak of the mountain, of which the cape forms a part, is 1917 feet above the sea; it may be seen 17 leagues out at sea.

FINLAND, a Russian grand principality, containing 134,829 square miles, and divided into eight circles. It consists of three parts:—1. That part of Finland ceded by Sweden to Russia by the Peace of Abo in 1743, and by the Peace of Nystadt in 1721; 2. That part which was ceded by Sweden at the Peace of Fredericksham in 1809, including all the rest of Swedish Finland; and, 3. That part of East Bothnia and Lapland ceded by the same peace. It is bounded N. by Norway, E. by the governments of Olonetz and Archangel, S. by the Gulf of Finland, W. by Sweden and the Gulf of Bothnia. The capital is Helsingfors. The country, in some parts, is mountainous and rocky, being traversed by the continuations of the Scandinavian Mountains, and, in others, is sandy, marshy, and abounding in lakes, which furnish one of the most characteristic features of the scenery. The most important are Lake Enara and Lake Ulea, and in part Lake Ladoga. The Tornea, the Kemi, and the Ijo are the most important rivers. Though so great a portion of the soil is unfit for agriculture, some parts are fertile in grain, potatoes, and flax, and good for grazing. The forests are very extensive, and furnish one of the chief sources of public revenue. In addition to timber, chiefly fir, large quantities of potash, pitch, and rosin are obtained from them, and form the principal articles of export. The principal minerals are iron, lead, sulphur, slate, and granite. Iron is wrought to some extent. The granite quarries yield blocks of great size and beauty, such as the obelisk monolith erected to the Emperor Alexander at St. Petersburg. Hunting and fishing are the chief occupations of many of the Finns. The population is densest on the coasts; the interior of this extensive country is very thinly peopled; some parts are without inhabitants, and some are incapable of supporting a dense population, on account of the extreme cold. The strong fortresses of Finland render it very important for Russia. The inhabitants are mostly Finns (see FINNS), with a few Russians, Germans, and Swedes. Up to the twelfth century the Finns lived under their own sovereigns, and were pagans. Their conversion to Christianity took place about the middle of that century, after their conquest by the Swedes. They are almost all Lutherans. They are somewhat phlegmatic in their temperament, but patient, laborious, not without enterprise, and very hospitable. Their prevailing vice is an excessive fondness for ardent spirits. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by the Treaty of Nystadt. The remainder was conquered from the Swedes in 1809, and now forms a division of the Russian Empire, under the name of a grand principality, the emperor exercising his supremacy as grand prince. The states, composed of the representatives of four social orders, are convoked by him; and no new laws can be enacted, nor new taxes imposed, without their sanction. Some modification of this constitution has been made by the substitution of a senate for the states, but it still continues to be at least virtually recognized; and the ordinary procedure of the courts of law is in accordance with the forms in existence

under Swedish rule. The proper seat of government is at St. Petersburg; but a governor-general, representing the emperor, resides in Helsingfors. Pop. 1,830,864.

Finnish Language and Literature.—The language of the Finns (Finnish or Chudic) belongs to the northern division of the Turanian or Ural-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It is masculine and agreeable to the ear, rich in vowels and diphthongs, copious, and uncommonly flexible. It possesses all the German vowels *a, e, i, o, u, ä, ö, ü*, which again give eight double vowels and twelve diphthongs. No syllable can begin with two consonants nor end with more than two. Like the other Turanian languages it adheres to the 'law of harmonic sequence of vowels,' according to which the vowels are divided into the two classes, heavy (*a, o, u*) and light (*e, i*, &c.), and only vowels of the same class can occur in the same word. Accordingly the vowels of the inflections adapt themselves to the stem vowel. The language is remarkably rich in declensional forms, there being as many as fifteen different cases expressing such relations as are expressed in English by *near, to, by, on, in, with, without, along*, &c. By particular modifications of the flexional elements these cases may further be made to express the relations of space, time, cause, &c. There is no distinction of gender in Finnish nouns. The possessive pronoun is indicated by suffixes. The verb resembles the noun in its capability of taking on different shades of meaning by corresponding modifications, and is in this respect a remarkable philological phenomenon. The Finnish proper is divided into three dialects, the Karelian or eastern; the South Finnish, which is the parent of the literary Finnish; and the Tavastian in the west.

Finnish literature is valuable chiefly for its rich stores of national poetry, which has been collected only in modern times, and has attracted deserved attention not only in the country itself but also in foreign countries, especially in Germany. The old and popular poetry of the Finns, as it appears in the various *runo* or ballads, is governed by rules of 'quantity' as in that of the Greeks and Romans, not by accent; rhyme does occur, but rarely; alliteration is employed as a rule. These poems which had been preserved by oral tradition from the times of heathendom were gradually dying out, and up to 1835 were known to the literary public only from single pieces published by Porthan, Schröter, Topelius, Becker, and Lönnrot. In that year, however, the last-named scholar grouped together in one whole all the fragments he could lay his hands on and published them, under the title of Kalewala, as the national epic of the Finnish people. A second edition, increased almost by one half, was published by him in 1849. He also published in 1840 Kanteletar, a collection of 592 ancient lyric poems and 50 old ballads; the Suomen kansan senalaskuja (1842), a treasury of 7077 popular proverbs; and Suomen kansan arwoituksia (1844), a collection of 2188 riddles. Another work that deserves notice is Cero Salmelainen's collection of legends and stories in prose, Suomen kansan satuja ja tarinoita (four vols., 1854–62). The first book in the Finnish language was printed at Abo in 1544, its author being Michael Agricola, afterwards bishop of Abo, who also translated the New Testament and part of the Old into Finnish. A complete Finnish Bible appeared in 1642. A great impetus has been given to the cultivation of the language in modern times. It is now recognized as an official language side by side with Swedish, and is becoming more and more the vehicle for imparting elementary instruction. Works on science and history, as well as poetry have been written in Finnish in recent times, and there are now a considerable number of Finnish newspapers. The centre of this literary life is Helsingfors.

FINLAND, GULF OF, a great arm of the Baltic, on the east side, having Finland on the north, and the Russian governments of Esthonia and St. Petersburg on the south. The length of the gulf from east to west is about 250 or 260 miles; breadth at the entrance or narrowest part, 40 miles; towards the head, where it is widest, about 80 miles. It receives but few rivers, and none of them, with the exception of the Neva, which enters it at its upper extremity, of any great size. It contains numerous islands, of which Cronstadt is the largest.

FINMARK (Danish and Swedish, *Finmarken*), a bailiwick in Norway, province of Tromsöe, forming the most northern part of the kingdom, bounded, E. by Russia, S. by Sweden and the bailiwick of Nordland, and on all other sides by the Arctic Ocean. It consists of a mountainous and usually sterile tract, stretching 140 miles north-east to south-west, with an average breadth of about 40 miles; its coast deeply indented by bays and lined by numerous islands. Both the severity of the climate and the general barrenness of the soil confine cultivation within very narrow limits. Where it is practicable the chief crops raised are barley and potatoes. The only trees are birch and pine, and occasionally willow and mountain-ash. The principal rivers are the Tana, forming the Russian boundary on the east, and the Alten. The valley of the latter is the finest part of the country, and presents some fine Alpine, and even rural scenery. The islands already mentioned, known by the general name of Loffodens, form a long line of coast where important fisheries are established. The cod-fishery employs a large number of boats and men, and a great quantity of cod-liver oil is made. Whales are occasionally caught off the coast. The inhabitants are Finns and Laplanders; they lead but a miserable life; they have very little grain, and often exist upon moss-bread and cakes made of the bark of young pine-trees. Pop 65,490.

FINNS, in their own language called *Suomalainen*, and by the Russians *Chudes* (that is, foreigners), are in the narrower sense a race of people inhabiting the north-west of European Russia (governments of Archangel and Olonetz), but especially the Grand-duchy of Finland. In a wider sense Finnic is the name applied to one of the five chief branches of the northern or Ural-Altaic division of the Turanian family of peoples and languages. The northern Turanians were formerly spread over the whole north of Asia and north of Europe, an area which they still largely occupy, and they are divided into the five families known as the Tungusic, Turkic, Mongolic, Samoiedic, and Uralo-Finnic or Finnic family proper. The last or most westerly family still forms the population of North Europe and North-west Asia, and formerly covered the greater part of Scandinavia. It is again divided into four groups or branches: 1, the Ugric, to which the Ostiaks, Vogulas, and Magyars belong; 2, the Bulgaric or Volgaic, consisting of the Tcheremisses, the Mordvins, and the Tchuvashes; 3, the Permic, composed of the Permians, Sirianes, and Votiaks; and 4, the Chudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Esthonia and Livonia, the Chudes (in the narrower sense) in the governments of Novgorod and Olonetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway. The Finns proper are again divided into two branches: the Tavastians in the south-west, and the Karelians in the east of Finland. The Finns may probably be identified with the Scythians of the ancients, and their earliest seats appear to have been

the Ural Mountains and the neighbourhood of the Caspian Sea. They originally led a peaceful nomadic life, but subsequently practised agriculture and adopted settled habits. They seem to have been compelled to migrate more to the north-west about the beginning of the Christian era, by the pressure of the Gothic tribes, and the country west of the Ural Mountains, more particularly the region where the Great and Little Volga unite, became their second home. From this the bulk of them had again to remove to their present abodes, though considerable numbers were left on the Volga, Oka, Kama, about the sources of the Dwina, in the Ural, and others again spread eastward, some of them as far as the Altai Mountains.

FINSBURY, a parliamentary borough, England, county Middlesex, forming the north part of London, having east the Tower Hamlets, west Marylebone, and south the city of London and liberty of Westminster. It embraces Clerkenwell, Islington, and other parishes; and near its south-eastern extremity are a square, circus, and district of its own name. Within its limits are situated several important buildings and institutions, including St. Bartholomew's and the Foundling Hospitals, the Charter-house, Gray's Inn, and the British Museum. Since the passing of the Reform Bill of 1832 it has sent two members to the House of Commons. Pop. (1871), 452,484.

FINSTERWALDE, a town of the German Empire, in the province of Brandenburg, Prussia, 40 miles north of Dresden, with flourishing manufactures of cotton and woollen cloths. Pop. (1871), 7370.

FIORD, the end of several Danish and Swedish geographical names, means an *arm of the sea*, a *narrow strait*, a *firth*.

FIR, in the narrower and stricter sense of the word, is the name of a genus of trees which belong to the order Coniferæ, and the sub-order Abietineæ, having solitary leaves growing round the branches. The fir is thus distinguished from the *pine*, the leaves of which grow in twos, threes, fours, or 'fives; and from the *cedar* and the *larch*, both of which have the leaves fasciculated. The term fir, thus limited, is applied only to the different varieties of the *silver fir* and the *spruce fir*. The silver firs are distinguished by having the cones erect, scales deciduous, and leaves flat. The common silver fir is the *Abies picea* of botanists, the *Pinus picea* of Linnæus. It is a native of the middle and south of Europe. The finest trees of this species are found in southern Italy; but the largest forests are those on the slopes of the Pyrenees, especially on the French side. It always prefers mountainous regions, and is sometimes found at a height of nearly 6000 feet. The height of the trunk is sometimes 150 feet, and the diameter above 6. It is the *sapin* of the French, and the *abies* of the ancient Romans. It is from this tree that Strasburg turpentine is procured; and its wood is of great use in ship-building (for masts, yards, and spars), in house-carpentry, &c. To this genus also belong the *Abies nobilis*, a large and beautiful tree discovered in Northern California, by Mr. Douglas, and since found also in Columbia; the *Abies Sibirica*, found on the Altaian Mountains; and the *Indian silver fir*, a native of the slopes of the Himalaya Mountains. The *Abies balsamea* or balm of Gilead fir, and the *Abies Canadensis* or hemlock spruce fir, also belong to this genus. The spruce firs have the cones pendulous, scales persistent, and leaves tetragonous. Of this division the common or Norway spruce fir (*Abies excelsa*) is the most important. It gets the name of the Norway spruce from the fact that in that country it constitutes the principal timber; but it is also extensively cultivated in the middle of Europe, and is found all over Siberia to the seventieth degree of N. lat. The average height of the tree is from 80 to 150 feet; and it attains its maturity in about seventy or eighty years. The branches, regularly arranged round the main stem and gradually diminishing towards the top, give the tree a pyramidal form. Nearly every part of this tree is of use. The wood (white or Christiania deal) is adapted to various ordinary purposes; the longest and thinnest stems are very valuable in ship-building for making masts; and the stems of those trees that are found at a great height, and in which accordingly the yearly rings are very narrow, are eagerly sought by musical instrument makers for sounding-boards. The bark is used in tanning; the pith of the young trees is eaten fresh by the Swedes and Laplanders; and the resin which exudes from the tree supplies the thus or common frankincense, and the Burgundy pitch of commerce. The so-called *Scotch fir*, being really a pine, will be found noticed under the article PINE.

FIRDUSI, ABUL KASIM MANSUR, the greatest epic poet of the Persians, was born at Khorassan about 931, and died there about 1020. His curiosity was excited and gratified by the ancient history of Persia, and he determined to adorn it with the charms of verse. On account of some difficulties he went to Ghizne (Ghazna), where the sultan Mahmoud then held his court, and attracted and collected the poets and learned men by his patronage. He entered the gardens of the royal palace and found Anasari, the poet of the sultan, in one of the arbours with two of his disciples, engaged in making extempore verses. Firdusi approached them and joined them in their occupation. Anasari, astonished to hear a stranger, in peasant's clothing, express himself with so much elegance, entered into conversation with him, discovered the purpose of his visit, and informed the sultan. Mahmoud afterwards ordered him to finish the Persian work, the ancient Shanameh or Bastanameh (literally, The Old Book), which contains the history of Persia, and which had been begun by Dakiki, promising him a piece of gold for each verse. Firdusi devoted a large number of years to this work, and produced an historical poem of 60,000 verses, entitled Shanameh (Book of the Kings), containing the history of the Persian rulers from the beginning of the world to the downfall of the Sassanian dynasty (632 A.D.), and consisting properly of a succession of historical epics. The achievements of the hero Rustam, the Persian Hercules, form one of the finest episodes. Firdusi presented his poem to the sultan, whose favour had been alienated by the calumnies of the enemies of the poet, and who gave him only a piece of silver for each verse. Indignant at this treatment, Firdusi struck out a number of verses in praise of Mahmoud, which he had inserted in his poem, and composed a bitter satire on the sultan (to be found in Jones' Poëseos Asiaticæ Commentarii). Compelled to flee he retired to the Persian town of Tus, where he lived in concealment. Meantime Mahmoud became sensible of his injustice, and having ascertained that Firdusi was still alive and in want, he ordered twelve camels, loaded with rich presents, to be sent to the poet. They arrived at the door of his house as his corpse was brought out for burial. The Shanameh is one of the finest Asiatic poems. No work in the Persian language can be compared with it. It is inestimable as a history, although as yet but little used. A good edition of the text is that of Captain Turner Macan (Calcutta, 1829), with a glossary. There is no complete English translation. An abridged translation, in prose and verse, by T. Atkinson, was published in 1831, and there are several other translations

of portions. A French translation, by Mohl, was published 1838–53, along with the Persian text.

FIRE. See COMBUSTION and HEAT.

FIRE ANNIHILATOR (L'extincteur), a portable machine invented, in 1849, by Philips, adapted to produce with great rapidity a dense cloud of steam mixed with carbonic acid and other gases, which, when directed upon a fire, quickly extinguish it. The machine is charged with a mixture of charcoal, nitrate of potash, and gypsum boiled together in water, and afterwards dried in a stove at the temperature of 100°. This mixture is moulded into the form of a brick, and in its axis is placed a bottle containing chlorate of potash and sugar, with a globule of sulphuric acid at the top. This charge is placed in a perforated cylindrical vessel, contained in another vessel of the same kind, and the whole is placed in a double cylindrical receiver with water at the bottom, and closed with two covers, with an opening for the escape of vapour. It is fired by a spike which, on being pressed, breaks the bottle, liberates the sulphuric acid, causes the combustion of the chlorate of potash and sugar, and fires the charge.

FIRE-ARMS. Under this designation are comprised all sorts of guns, rifles, fowling-pieces, blunderbusses, pistols, &c., which effect their discharge by the combustion of gunpowder. The manufacture of these weapons in England is extensive, employing at all times, but especially during war, a large number of persons. In consequence of the frequent accidents from the bursting of insufficient barrels, the legislature of Great Britain has very properly interfered, not to regulate their manufacture, but to prevent all persons from using or selling barrels that have not been regularly proved in a public proof-house. The first act for this purpose was passed in 1813; but it was soon after superseded by a fuller and more complete one, the 55 George III. cap. lix. This statute imposes a fine of £20 on any person using, in any of the progressive stages of its manufacture, any barrel not duly proved; on any person delivering the same, except through a proof-house; and on any person receiving, for the purpose of making guns, &c., any barrels which have not passed through a proof-house. These penalties to be levied on conviction before two justices; with like penalties to be similarly levied on persons counterfeiting the proof-marks. See CANNON, GUN, RIFLE, &c.

FIRE-BALLS.—1. In natural philosophy, globular masses of fire of different magnitudes moving through the atmosphere with greater or less velocity, often with burning tails, when they are called *fiery serpents*. Small balls of this sort are called *shooting-stars*. There are various conjectures in regard to the nature of these phenomena. Chladni considers them to be solid masses formed above the region of our atmosphere, and classes them with aerolites or meteoric stones. (See METEORS.)—2. In gunnery, every ball which is capable of being ignited and burned. In military operations such balls are thrown by night from mortars or howitzers towards quarters which it is desirable to examine.

FIRE-BRIGADES. The problem of the management of the public fire-engines and the means of extinguishing fires generally is one that is differently solved in different towns and countries. For the metropolis there was an act passed in 1774 requiring every parish to provide itself with one large and one small engine, hose, ladders, and everything else necessary in case of fire. But this law was never well carried out in any but a few of the parishes of London; and as a rule these parish engines were very inefficient, partly from the nature of the engines themselves, and partly from their bad management. The first London fire-brigade was an institution entirely independent of the parishes, as indeed also of the government and of the corporation of London. It was created, and till its place was taken by an organization constituted by act of Parliament in 1865, exclusively supported by the insurance companies of the metropolis. At first every insurance company had its own fire-engines and its own men to work them; but in 1825 some of them joined, and when the advantages of union were seen most of the other companies desired to take part in the combination already formed, the result of which was that in 1833 a more extensive organization was made, to which the name of the London Fire-brigade was given. Such was the state of matters until, by act 28 and 29 Vict. cap. xc. (July 5, 1865), the duty of extinguishing fires and protecting life and property in case of fire was declared to be intrusted to the Metropolitan Board of Works within their jurisdiction, and provision was made for the establishment of the Metropolitan Fire-brigade. The act provides for the support of the brigade by contributions from three sources:—1. By a grant from the treasury not exceeding £10,000 annually. 2. By an assessment on the ratable property within the metropolitan area amounting to not more than ½*d.* per £ on the annual rental. And 3. By a payment made by the insurance companies at the rate of £35 per million of property insured in the metropolis, which in the year ending December 31st, 1872, realized £16,267. This brigade has now stations in all parts of London, at each of which a number of men are constantly in attendance. All the stations are in direct communication by telegraph with the central station, so that all the engines, or any required number of them, may be summoned to any given spot without delay. In London there is not, as in many of the continental towns, an organized system of watchmen to look out for fires; but by the offer of a reward to whoever brings the first notice of a fire to one of the stations timely information is always obtained. The engines in use in London are for the most part large ones, drawn by horses, but there are also several hand engines; and some again are pumped by steam, while others are pumped by the hand. (See FIRE-ENGINE). In 1872 the cost of the maintenance of the brigade was £67,520; of the stations, £8793; total, £76,313. London is not, however, entirely dependent on this brigade for extinguishing fires; for all the dock companies have engines of their own, and others are kept up by several private establishments. In Glasgow and Manchester the fire-brigade is only partly supported by the insurance companies, and in Liverpool not at all. In these towns, too, and at the London docks, the engines are greatly assisted by the use of hydrants, or high-pressure fire-plugs, to which the hose may be attached directly, and which will throw a jet of water to all but the highest houses; but in London itself, the water being at low pressure, this expedient cannot be resorted to.

FIRE-CLAY is distinguished from ordinary clay by its refractoriness and infusibility, which render it an excellent material for bricks, crucibles, glass pots, retorts, and similar vessels which are to be exposed to a constant and very high temperature, at which ordinary bricks and clay vessels would fuse and become vitrified. This difference is due to the purity of fire-clay, or at least to the absence from it of iron, lime, magnesia, and alkalies, in appreciable quantities. It consists of hydrated silicate of aluminium almost entirely, but many contain traces of organic matter, and of some of the bases mentioned above. Very great differences in composition are, however, met with, accompanied by corresponding variations in quality, but it may be said that the silica ranges from 60 to 74 per cent., the alumina from 16 to 26 or 27 per cent.,

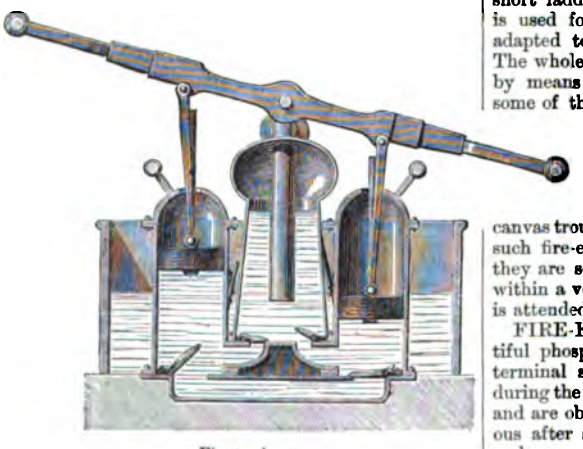
and ferrous compounds from 2 to 3 per cent. The best clays contain the largest amount of silica, but only part, and a variable part, is already combined with the bases. Some is in the condition of quartz or sand, some as hydrated acid. Probably on heating, the silica enters more completely into union with the alumina. The combined water in clay gives it its plasticity; for if it is once driven off by ignition, the clay changes its character, and cannot re-absorb water or be moulded. On the other hand, a quantity of burned clay should always be mixed with the wet clay, as it prevents the shrinking and cracking which the wet clay undergoes when dried prior to burning. When it has been burned in the kiln the fire-clay changes colour and becomes whiter than before, whereas ordinary clay becomes red, from the oxidation of the disseminated iron. But after long exposure in a furnace the colour darkens, and may become even black, a change due apparently to the formation of silicate of iron.

The most highly esteemed fire-clay is that of Stourbridge, which is used wherever high temperatures have to be resisted. Fire-clay belongs to the coal formation, and always forms a stratum immediately below the coal. It seems, indeed, to be part of the soil on which the coal vegetation flourished and died.

FIRE-DAMP. See DAMPS.

FIRE-ENGINES. The ordinary fire-engine is formed by the union of two forcing-pumps which play into a common reservoir, containing in its upper portion (called the air-chamber) air compressed by the working of the engine, as shown in the accompanying figure.

A tube dips into the water in this reservoir, and to the upper end of this tube is screwed the leather



Fire-engine.

hose through which the water is discharged. The piston-rods are jointed to a double lever, the ends of which are connected with two long handles running parallel to the engine on each side, so that the lever may be worked by several men at once. The ends of the lever are thus raised and depressed alternately, and one piston is always ascending while the other is descending. Water is thus continually being forced into the common reservoir except at the instant of reversing stroke; and as the compressed air in the air-chamber performs the part of a reservoir of work (nearly analogous to the fly-wheel), the discharge of water from the nozzle of the hose is very steady. The engine is sometimes supplied with water by means of an attached cistern (as in the figure), into which water is poured; but it is more usually furnished with a suction-pipe which renders it self-feeding. The moving power of steam has also been applied to the working of fire-engines. The plunger of the pump is connected by rods with the piston of the steam-engine, which thus takes the place of the men employed to work the lever in hand fire-engines. The most recent form of the steam fire-engine is that constructed by Shand, Mason, and Co., of London; and several of these engines are now made use of by the London and other fire-brigades. Floating fire-engines have also been constructed, and steam power has been applied to them in such a manner that it may be used either to propel the vessel or work the pumps.

FIRE-ESCAPE, the name applied to any means of escape from a burning building. Many suggestions have been made for contriving the means of effecting this, some of them being for apparatus to be used in the interior of a building, and some to be used from without. Of the contrivances to be used within a building the simplest are a rope firmly attached to something near a window, or a rope sliding over a pulley fixed to the window-sill, and the like. And of the different machines that have been made for use from without that which is found to be the most useful is the one adopted by the Society for the Protection of Life from Fire—a society formed in London in 1836, and entirely supported by private subscriptions. This machine was invented by Wivell, and consists of a wheel-carriage supporting a long ladder with a canvas trough underneath, protected by a copper-wire net. The ladder consists of two parts, the main ladder and the upper ladder, the upper folding over the main ladder, and when required is raised to its position by ropes. There is also another short ladder carried underneath the carriage, which is used for first stories, while the main ladder is adapted to the height of ordinary second stories. The whole length of the ladder is about 45 feet, but by means of a short supplementary ladder which some of the escapes carry it may be increased to 50 feet. When used the ladder is set to the window of a building which is burning; the attendant mounts it, and assists those who are in danger to descend it, or, if necessary, lets them slide down the canvas trough. There are now about 100 stations for such fire-escapes in different parts of London, and they are so situated that every house in London is within a very short distance of one. Each of them is attended throughout the night by a conductor.

FIRE-FLY, a small beetle which emits a beautiful phosphoric light from the under surface of the terminal segments of the abdomen. In America, during the summer months, these little insects abound, and are observed to be particularly active and luminous after slight showers of rain, studding the trees and grass with their pale lights; they are members of the family Lampyridæ. The phosphoric light produced by these animals is of a greenish yellow, and proceeds from a group of cells, sometimes transparent, sometimes filled with granular matter, and associated with the finely ramifying respiratory tubes. This light is under the control of the individual, though when the posterior abdominal rings containing the apparatus are separated from the body of the insect it continues to shine for some time, but, gradually becoming paler, is at length extinguished. This curious provision of nature is said to be for the purpose of directing the sexes to each other; but this explanation is unsatisfactory, since the larvæ also possess the property; but the light comes from the anterior rings. The males of some species also emit a feeble light. It is possible that enemies are de-

terred by the shining. In Europe the fire-fly is replaced by the glow-worm, a wingless female insect of this genus. The male is not luminous, and is guided to his mate by the light which she emits from a receptacle similar to that with which the American species are provided. See ELATER.

FIRELOCK, the old name of a musket or pistol with a wheel-lock, afterwards applied to flint-locks. Milton says, 'If it should happen that a tyrant (God turn such a scourge from us to our enemies) should come to grasp the sceptre, here were his spear-men and his lances, here were his firelocks ready.'

FIRE ORDEAL. See ORDEAL.

FIREPLACE. See GRATE and STOVE.

FIRE-PROOFING. The subject of fire-proofing embraces the different plans that have been adopted to construct buildings and repositories for valuable articles capable of resisting the action of fire, and to render wood and textile fabrics incombustible. The method that is resorted to in making so-called fire-proof buildings consists in the avoiding, as far as possible, of all inflammable materials in their construction. The walls and partitions are of stone or brick, the doors, ties, &c., of iron, and lime or cement is used between the ceiling of one story and the floor of another in order to prevent the fire from reaching from the one to the other. In theatres there is sometimes an iron partition which may be let down between the stage and the body of the theatre, so as to confine the fire to the former if it should have broken out amongst the scenes.

A great deal of ingenuity has been applied, especially within the present century, to the construction of fire-proof safes. They are now generally constructed with double walls of stout iron, having a space of 3 to 4 inches thick between the walls, filled with some substance which is a very bad conductor of heat. Burned clay, powdered charcoal, ground alum, baked wood-ashes, sawdust, are a few of the substances most commonly used for this purpose. In order still further to diminish the conductivity of the walls of the safe small vessels filled with some liquid are frequently put in along with the substances just mentioned. The effect of this is that, when the safes are exposed to an unusual degree of heat, these vessels burst and allow the liquid contained in them to escape, which thus greatly retards the progress of the heat. Recently another device has been made use of, which consists in the employment of crystals of alum instead of the small vessels filled with liquid. As alum in its crystallized state contains nearly half its weight of water, which gradually evaporates when high temperatures are reached, and as it in so doing absorbs a considerable amount of heat, it to the same extent prevents the increase of temperature in the safe. But it ought to be mentioned that all these so-called fire-proof safes and fire-proof buildings are not really fire-proof, for they will not resist effectually any degree of heat for any length of time; and this is especially the case with the latter.

Of the various chemical substances which have been used with the view of rendering wood fire-proof the best is found to be a solution of silicate of soda. Wood carefully painted with this solution has been found not even charred after a long exposure to a fierce flame.

Among flexible fibrous substances capable of being spun and woven into tissues the asbestos possesses pre-eminently the property of slowly conducting heat; but the other fibrous matters in common use for the purposes of clothing, such as wool, cotton, &c., may, by immersion in certain saline solutions, be rendered very imperfect conductors. Sulphate of ammonia and tungstate of soda are those which are most commonly used. The former is cheap, but has the disadvantage of becoming decomposed when the article immersed in it is ironed, and accordingly it is only recommended for use in factories, while the latter is better suited for ordinary domestic use. Borax is also very well adapted for rendering articles of dress fire-proof, but it weakens the tissue of the material, and thus renders it more liable to tear.

FIRE-RAISING, in Scotch law, is the same as arson in English law. See ARSON.

FIRE-SHIPS are generally old vessels filled with combustibles, fitted with grappling-irons, to hook enemies' ships, and set them on fire. If they are used on a river they are allowed to be carried down by the current, if they are used at sea advantage is taken of a favourable wind to bear them into the midst of the enemy and set their ships on fire, while the crews of the fire-ships make their escape in boats kept ready for the purpose. In ancient times the Tyrians employed them against Alexander, and the Carthaginians against the Romans; and during the Christian era the Crusaders made use of them at Ptolemais (Acre). In the time of Philip II. the Spaniards suffered severely by them on two well-known occasions. The first was at the siege of Antwerp in 1585, when by means of fire-ships Gianibelli utterly destroyed a bridge that the Duke of Parma was attempting to throw over the Scheldt, with the aid of some other vessels which he had prepared so as to explode when they reached the bridge. The second case was when Lord Howard of Effingham used them with such effect against the Armada in 1588. In this case also their use is said to have been suggested by Gianibelli. The Greeks in their struggle with Turkey also employed them with great success. During the last war with the Chinese whole fleets of such vessels were often sent against the British war-ships, without, however, inflicting the slightest damage.

FIRE-WORKS. See PYROTECHNY.

FIRE-WORSHIP. See GUEBERS.

FIRMAMENT, in the Ptolemaic astronomy, the eighth heaven or sphere, with respect to the seven spheres of the planets which it surrounds. It is supposed to have two motions, a diurnal motion, given to it by the *primum mobile* from east to west, about the poles of the ecliptic; and another opposite motion, from west to east, which last it finishes, according to Tycho, in 25,412 years; according to Ptolemy, in 36,000; and according to Copernicus, in 25,800; in which time the fixed stars return to the same points in which they were at the beginning. This period is called the *Platonic* or *great year*.

FIRMAN.—1. Among the Turks, an order which the grand vizier issues in the name of the sultan.—2. In the East Indies, a written permission to trade. See TURKEY.

FIRST-FRUITS (English law). By the old feudal tenures one year's profit of the land, after the death of a tenant, belonged to the king. In ecclesiastical tenures this right was transferred to the pope, and subsequently in England to the crown. These ecclesiastical first-fruits were called *annates*. See ANNATES.

FISCAL, from *fiscus* (which see).—1. In most German states is an officer who has charge of the state treasury. The imperial fiscal of the old German Empire was the public prosecutor in the event of the violation of the laws or privileges of the empire, such as violations of the right of coinage, disturbances of the peace, &c.—2. In the German states, as in Scotland, the fiscal is also the public prosecutor in the criminal courts. This use of the name seems to arise from the ancient practice of punishing most violations of the criminal law by a fine. See PROCURATOR FISCAL.

FISCHART, JOHANN, also called *Mentzer*, and in his different works by other names, was born at Mainz, between 1545 and 1550. He became Doctor of Laws, and about 1586 was bailiff of Forbach, near Saarbruck. He died in 1589. Little is known of his life, and there is much which is unintelligible in his writings; they are mostly satirical, partly in prose, partly in verse, partly of both mixed together, and have the most whimsical titles. As a satirist he is the most unrestrained of his age, inexhaustible in droll, humorous, and witty thoughts, not seldom guilty of equivoque and obscenity, intimately acquainted with the follies of his age, and never at a loss whether to ridicule or lash them. He treats the German language with the greatest freedom, coining new words and turns of expression without any regard to analogy, and displaying in his most arbitrary formations, erudition and wit. In the broad comic and burlesque he is not to be surpassed, and even in his most satirical effusions there is an honesty and good nature always observable. His most celebrated works are a rifaccimento of the Gargantua of Rabelais, first printed in 1552; Das gluckhaft Schiff von Zurich (The Lucky Ship of Zurich), 1576, 4to, and several others. We find in Fischart the first attempt at German hexameters. J. Paul Richter says he is much superior to Rabelais in regard to language, images, and meaning, and is equal to him in erudition and in an Aristophanic creation of words. He is rather the reviver of Rabelais than his translator.

FISCUS. *Fiscus* signified in the time of the early Roman emperors the private treasury of the emperor, as distinguished from the public treasury, the *ærarium publicum;* as the emperors, however, monopolized all the powers of the state, the fiscus came gradually to take the place of the ærarium, and the former term replaced the latter. In modern law fiscus denotes the public treasury, particularly when considered in a legal point of view; for instance, as entitled to all fines, or goods without an owner, or which are forfeited by the owner, &c.; or when we speak of its particular privileges. These privileges were formerly very extensive, including the right to demand interest without the corresponding obligation of paying it; the right to sue without responsibility for the expenses of the defender, &c. Modern notions of equity have tended considerably to diminish the fiscal rights of the crown in England, but except in as far as they have been voluntarily ceded, they still continue to form a part of the royal prerogative, which is determined by use rather than by positive statute. Fiscal privileges, that is, the right of having a public treasury with special prerogatives, was formerly frequently conferred on cities, universities, and other corporations.

FISH. See ICHTHYOLOGY.

FISHER, JOHN, Bishop of Rochester, a learned Catholic divine in the reign of Henry VIII. He was born in 1459, at Beverley, in Yorkshire, and received his education at Cambridge, which he entered in 1474. He graduated M.A. in 1491, and obtained a fellowship. In 1495 he was chosen master of Michael House, now incorporated with Trinity College, and entered into holy orders. Margaret, countess of Richmond, chose him for her confessor; and, through his influence, determined on the noble academical foundations which have perpetuated her memory. In 1501 he received the degree of D.D., and was made chancellor of the university. In 1502 he became the first Margaret professor of divinity at Cambridge. In 1504 he was promoted to the see of Rochester on the recommendation of Fox, bishop of Winchester. He subsequently declined translation to a more valuable bishopric; and he was accustomed to style his church his wife, declaring that he would never exchange her for one that was richer. Deeply prepossessed in favour of the ancient faith of the nation, he opposed with zeal and perseverance the principles of Luther and his followers. But the same conscientious motives which induced Fisher to become the champion of Henry VIII., impelled him to oppose the king's measures for procuring a divorce from his wife, and declaring himself head of the church. In 1527 he was the only prelate who had the courage to refuse to sign a declaration that the marriage of the king was unlawful. On the Shrove Tuesday of the same year he was engaged in burning Tindall's Bibles at Paul's Cross. In 1529 he opposed the Clergy Discipline Act. His imprudence and weakness in listening to the pretended prophecies of Elizabeth Barton, or the maid of Kent, subsequently furnished the court with an opportunity of punishing his opposition to the royal designs. In 1534 an act of attainder was passed against Barton and her accomplices, among whom Bishop Fisher was included; and being adjudged guilty of misprision of treason, he was condemned to the forfeiture of his property, and imprisonment during the king's pleasure. It does not, however, appear that this sentence was executed, a fine of £300, it is said, having only been exacted. He was subsequently sent to the Tower for refusing to submit to the provisions of an act of Parliament which annulled the king's marriage with Catharine of Arragon, and confirmed his subsequent union with Anne Boleyn. He was attainted and deprived in 1534. Pope Paul III. thought proper to reward his zealous adherent by creating him a cardinal (May, 1535). The king exclaimed in a passion, 'Mother of God! he shall wear it on his shoulders, for I will leave him never a head to set it on.' His destruction was immediately resolved on; and as no evidence against him existed sufficiently strong to affect his life, Henry employed his infamous solicitor-general Rich to entrap Fisher into a positive denial of the king's supremacy. The plot succeeded, and the bishop, being tried before a special commission, was convicted of high treason, on the evidence of Rich, and on the 22d of June, 1535, was beheaded on Tower Hill. Bishop Fisher was a promoter and cultivator of literature, and a patron of learned men. Besides a number of tracts, he was also the author of a commentary on the Seven Penitential Psalms; of sermons, controversial and devotional treatises, &c.

FISHERIES. The most important objects of the fisheries are the whale, cod, ling, herring, sturgeon, mackerel, salmon, eel, anchovy, sardine, oysters, &c. Some account of the localities they frequent, and the manner of taking them, will be found under the respective heads. (For whale see WHALE FISHERY.) Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. One of the commonest of these was by means of bounties. (See BOUNTY.) The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the mode of capture, &c., which vary with the particular circumstances. The more important of these will be found under the heads of the fisheries to which they apply.

FISHERMAN'S RING (*annulus piscatoris*). The fisherman's ring is a ring appertaining to the pope. Up till the sixteenth century it bore on one side the images of St. Peter and St. Paul; since then, instead of these, it has the arms of the reigning pope. On the other side it bears the name of the reigning pope.

It is used as the pope's signet by the officers intrusted with the signing of briefs and bulls. On the death of the pope it is broken, and a new one is presented to his successor by the city of Rome. See BRIEF and BULL.

FISHING-FROG. See ANGLER.

FISSIROSTRES, in ornithology, a family or group of the order Passeres, or Insessores, formed by Cuvier, and which constitutes one of the four great subdivisions of the order, the others being Conirostres, Dentirostres, and Tenuirostres. The Fissirostres are distinguished by the shortness of the beak and its great width of gape, and also by the shortness of the legs. They live mostly upon the wing, and prey upon insects; the leading species, among which are the swallows, fly about with widely opened mouths, which they close upon their prey with a powerful clasp, while the insects they take are prevented from escaping by a fence of bristles round the opening of the bill, and a viscid saliva, with which the tongue and interior of the mouth is covered, which also furnishes material for cementing their nests. These birds are also generally distinguished by the proportional length of their wings and the swiftness and duration of their flight. The beak of the Fissirostres is short, broad, horizontally depressed, deeply cleft, and generally hooked. They are birds of passage, quitting Europe in winter, and are divided into two groups, the diurnal and nocturnal, the former consisting of the swallows (Hirundinidæ), the latter of the goat-suckers (Caprimulgidæ).

FITZ (the old French word for *fils*, son), a syllable frequently prefixed to the English surname (Fitz-Herbert, Fitz-Clarence, Fitz-James), which, like the Scottish *Mac*, the Irish *O'*, and the Hebrew *Ben*, signifies son, and, in union with the name to which it is prefixed, indicates the ancestor of those who bear it. We must also add the essential distinction, that *Fitz* always denotes illegitimate descent. Thus there are Fitz-Clarences, sons of the Duke of Clarence, afterwards William IV., and the actress, Mrs. Jordan. There are many noble families of such origin, who include their royal progenitors in their genealogical tables.

FITZROY, ROBERT, ADMIRAL, meteorologist, born 5th July, 1805, was the youngest son of General Lord Charles Fitzroy, by his second wife. He entered the royal navy in October, 1819, and became lieutenant in 1824. He served in the Mediterranean and South American stations, and at Rio Janeiro, in 1828, he became flag-lieutenant to Rear-admiral Robert Otway. From 1828 to 1836 he was employed in hydrographical surveys, and in forming a chain of meridional distances round the globe. In 1841 he was chosen member of Parliament for Durham, and in 1843 he was appointed governor of New Zealand, which post he held till 1846. In 1854 he became superintendent of the meteorological department of the Board of Trade, and held this appointment till his death. In 1857 he was promoted to the rank of rear-admiral, and in 1863 to that of vice-admiral. He acquired a high reputation for his researches in meteorology, and great popularity with the public for the system of storm-warnings which he established, and which was discontinued by the Board of Trade after his death. He committed suicide while in a state of mental derangement, 30th April, 1865.

FIUME (German, *St. Veit am Flaum;* Illyrian, *Reka*), a seaport town in Austria, on the small river Fiumara, where it falls into the Gulf of Quarnero, in the N.E. extremity of the Adriatic. Fiume is the seat of a military governor, a mercantile and commercial court, a maritime consulate, sanitary directory, custom-house, and bridewell; and possesses a gymnasium, a high school, and a burgher hospital. Its manufactures include linen, leather, woollens, refined sugar, refined wax, tobacco, and especially rosoglio, but ship-building is the main-stay of the place, for which the splendid forests of the Julian Alps afford the greatest facilities. The harbour is very indifferent, and admits only small vessels; but the roadstead has sufficient depth of water for vessels of any size at a few hundred yards from the shore, and if not completely, is at least well sheltered. The principal exports are corn, tobacco, wood, fruit, and salted provisions; the principal imports—sugar, rice, spices, and salt. There is a magnificent road of 73 miles over the Julian Alps to Carlstadt, but land carriage over this hilly route is expensive, and the trade of the port is consequently restricted. Pop. 13,314.

FIXED OILS. See OILS (FIXED).

FIXED STARS, those stars which appear to remain always at the same distance from each other, and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets. But besides the apparent motion of the fixed stars, resulting from the diurnal rotation of our earth upon its axis and from the precession of the equinoxes (see PRECESSION OF THE EQUINOXES) and the aberration of light (see ABERRATION), a very slow, proper motion has been observed in them, so that it is not strictly true that the fixed stars remain in the same relative position. It has been found that Sirius, for example, has, since the time of Tycho-Brahe, moved about two minutes from its place, &c. But Herschel (On the Proper Motion of the Sun and Solar System, in the Philosophical Transactions, vol. lxxiii.) has proved that this apparent change of place results from a real motion of our whole solar system in the celestial spaces. Stars have also been seen to appear suddenly in the heavens, and again to disappear. Of others it has been remarked that their size appears alternately to increase and to diminish. Their distance from our earth is, with a few exceptions, literally immeasurable. The most powerful telescopes cannot give them a sensible diameter. We can obtain an idea of their distance from the circumstance that, although we approach them by 91,000,000 miles (the radius of the earth's orbit), and recede from them as far, we can find no difference in them. Huyghens, by comparing the light of Sirius with that of the sun, tried to determine its distance from the earth, and, upon the supposition that Sirius is of the same size as the sun, made its distance 27,664 times greater. We are still in ignorance with regard to the nature and constitution of the fixed stars; but stellar spectroscopy leaves little doubt that they are luminous suns, around which, as around our sun, planets revolve in determined paths, receiving from them light and heat. The fixed stars are divided according to the differences in their brilliancy, which are very visible to the naked eye, into stars of the first, second, third magnitude, &c. But besides these stars which appear in the heaven as distinct bright points of light, the eye, in the clear winter nights, sees here and there little white clouds. These nebulous spots are groups of innumerable stars, which the telescope reveals to us; and the limited power of our instruments alone prevents us from looking forward, without end, into the infinite regions of space. See also PROPER MOTIONS OF THE STARS.

In order to distinguish more easily the fixed stars from each other, names were given to the most remarkable of them in very ancient times, and they were divided into groups or constellations (which see). Astronomers have given descriptions of all the stars,

according to their situations, with their names, magnitude, &c. Cassini, Lalande, Zach, and Piazzi have done so; and great praise is due to J. E. Bode's Uranographia, sive Astrorum Descriptio, xx. Tabulis æneis incisa, ex recentissimis et absolutissimis Astrorum Observationibus (Berlin, 1801). Among other catalogues are Lacaille's catalogue of 9766 stars, reduced at the expense of the British Association, and printed at the expense of the government, with preface by Sir John Herschel.

FIXLMILLNER, PLACIDUS, a Benedictine monk and astronomer in the monastery of Kremsmünster, in Upper Austria, was born at Achleuthen, a village near Kremsmünster, March 28, 1721, and died, Aug. 27, 1791. He was forty years professor of the canon law at a school for young noblemen at Kremsmünster, but he owes his reputation to his astronomical writings and observations. His uncle, the abbot of the monastery, established a mathematical hall, and, at a later period, an observatory for the monastery. The works of Lalande, and the assistance of a common carpenter of the village, who did not know how to read or write, were Fixlmillner's chief aids in carrying these arrangements into effect. Under his direction the artisan made the quadrants, zenith-sectors, transit instruments, and clocks; and the observatory of Kremsmünster became one of the most distinguished in Germany. By his numerous observations of Mercury (then very difficult to make) Lalande was enabled to compile his accurate tables of that planet. Fixlmillner was one of the first observers and calculators of the orbit of Uranus, of which he constructed tables. He was the first who scientifically examined and proved the truth of Bode's supposition that the star thirty-four of Taurus, observed by Flamsteed in 1690, and afterwards lost, was the same as this planet. He made all his calculations himself, and always twice over.

FIXTURES, in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property, and pass to the freeholder, not being removable at will by the tenant or occupier of the property. The law in regard to fixtures is not exactly alike in England and Scotland, but its tendency is the same in both countries, and in the former it has been elucidated by more frequent decisions. The principal case in which the question of fixtures is liable to arise is between landlord and tenant. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent. Large exceptions are made to this rule in favour of the tenant, covering generally fixtures for trade, for agricultural purposes, and for ornament or convenience; but the removal must not injure the land or buildings of the landlord, and in the case of farm buildings, &c., the landlord is entitled to a month's notice and to the option of purchasing the fixtures at a value determined by a reference. In questions between an heir and a personal executor the interpretation of fixtures is more favourable to the heir. In Scotland matters of this kind are frequently determined by express stipulation in the lease.

FLACCUS, CAIUS VALERIUS, a Roman poet of the latter half of the first century, who lived in Padua (*Patavium*), and died young. He sung the expedition of the Argonauts in an epic poem (Argonautica), of which seven books and part of the eighth have remained to us. His model was the Alexandrian Apollonius Rhodius.

FLAG. A flag is a strip of cloth of a light fabric, varying in form and colour, and frequently bearing some emblematic design, which is fixed by one end to a staff, or support, while the other is allowed to fly free. The uses of flags are numerous. They serve in a variety of ways as signals. They convey definite information of various kinds, and are used as general symbols of rejoicing, congratulation, sympathy, mourning, &c. In a classification of the uses of flags, that which stands first, as the most general, is their use as national emblems. Pl. LXXI. LXXII., which gives a coloured representation of the various flags of the leading nations, will fully explain this use. Next in order comes the use of flags as the distinguishing emblems of the naval and military forces of particular nations. In the army each regiment is distinguished by its particular banner. This usage is general, and the colours of regiments come to be distinctive of their services and of their *esprit de corps*, as well as of their position in the army. They are presented by persons of rank, frequently wrought by fair hands, and bear names and emblems commemorative of past achievements. In Catholic countries their consecration is a religious ceremony. This use of flags is of great antiquity. In the Bible we find the standards of the different tribes referred to in the arrangement of the camp of the Israelites in the desert. The Greek and Roman armies had their distinctive flags. In the French army distinctive flags were introduced during the wars in Italy in the sixteenth century. The word *drapeau* in French (which, in its most extended signification, is equivalent to our flag) is used specifically for the colours of an infantry regiment; *étendard* for those of a cavalry regiment; *pavillon* for the colours used in the naval service.

In the navy, as in the army, flags are used as the distinction of particular nations, as the emblems of rank and precedence, and of the relations of peace and war. From the nature of the service flags are much more freely used for these purposes at sea than on land. In the British navy an admiral's flag is hung from the maintopgallant-mast-head, a vice-admiral's from the foretopgallant-mast, a rear-admiral's from the mizzentopgallant-mast. In the French service a similar distinction is observed. Red, white, and blue flags were formerly used in the British navy, but this distinction has been done away with. A white field with the red St. George's cross, and the Union Jack at the upper left hand corner, is now the only distinguishing flag used in the royal navy; the blue flag is assigned to the reserve, and the red to the mercantile navy. The royal standard is hoisted only when the king or queen is on board; the anchor of hope for the lord high-admiral or lords of the admiralty; the union flag for the admiral, &c. When a council of war is held at sea, if it be on board the admiral, they hang a flag on the main shrouds; if in the vice-admiral, in the fore shrouds; and if in the rear-admiral, in the mizzen shrouds. The flags borne on the mizzen are particularly called *gallants*. To lower or strike the flag is to pull it down upon the cap, or to take it in, out of respect or submission to superiors. To lower or strike the flag in an engagement is a sign of yielding. A sign of mourning is to hoist the flags a half or two-thirds of the masts. Besides the use of flags as distinguishing emblems, a very important use of them at sea, both by national and mercantile navies, is as signals according to an arranged code. See SIGNALS (CODE OF MARITIME).

FLAGELLANTS (from the Latin *flagellare*, to lash or scourge), the name of a sect in the thirteenth century who thought that they could best expiate their sins by the severe discipline of the scourge. Rainer, a hermit of Perugia, is said to have been its founder, in 1260. He soon found followers in nearly all parts of Italy. Old and young, great and small, ran through the cities scourging themselves, and ex-

horting to repentance. Their number soon amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms. In 1261 they broke over the Alps in crowds into Germany, showed themselves in Alsatia, Bavaria, Bohemia, and Poland, and found there many imitators. In 1296 a small band of Flagellants appeared in Strasburg, who, with covered faces, whipped themselves through the city, and at every church. The princes and higher clergy were little pleased with this new fraternity, although it was favoured by the people. The shameful public exposure of the person by the Flagellants offended good manners; their travelling in such numbers afforded opportunity for seditious commotions and irregularities of all sorts; and their extortion of alms was a severe tax upon the peaceful citizen. On this account, both in Germany and in Italy, several princes forbade these expeditions of the Flagellants. The kings of Poland and Bohemia expelled them with violence from their states, and the bishops strenuously opposed them. In spite of this the society continued so numerous, under another form, in Germany and France, in the fraternities of the *Beghards* (see BEGUINES), and in the beginning of the fifteenth century in Thuringia, under the name of *Brothers of the Cross* (so called from wearing on their clothes a cross on the breast and on the back), that the council assembled at Constance, between 1414 and 1418, was obliged to take decisive measures against them. The sect, however, or at least some orders bearing the the same name, continued to exist in Italy, Spain, Germany, and the south of France, and some traces of it may be found even at the present day. Henry III. of France caused himself to be affiliated to an order of Flagellants called the Blancs-battus of Avignon.

FLAGELLATION has almost always been used for the punishment of crimes. Its application as a means of religious penance is an old oriental custom, admitted into Christianity partly because self-torment was considered salutary as mortifying the flesh, and partly because both Christ and the apostles underwent scourging. From the first century of Christianity religious persons sought to atone for their sins by voluntary bodily torture. Like the Abbot Regino, at Prum, in the tenth century, many tried to imitate the sufferings of Christ, in order to make themselves the more certain of forgiveness through him. It became general in the eleventh century, when Peter Damiani of Ravenna, abbot of the Benedictine monastery of Santa Croce d'Avellano, near Gubbio, in Italy, afterwards cardinal bishop of Ostia, zealously recommended scourging as an atonement for sin, to Christians generally, and, in particular, to the monks. His own example and the fame of his sanctity rendered his exhortations effective. Clergy and laity, men and women, began to torture themselves with rods, and thongs, and chains. They fixed certain times for the infliction of this discipline upon themselves. Princes caused themselves to be scourged naked by their father confessors. Louis IX. constantly carried with him for this purpose an ivory box, containing five small iron chains, and exhorted his father confessor to scourge him with severity. He likewise gave similar boxes to the princes and princesses of his house, and to other pious friends, as marks of his peculiar favour.

The wild expectation of being purified from sin by flagellation prevailed throughout Europe in the last half of the thirteenth century. 'About this time,' says the monk of Padua in his chronicles of the year 1260, 'when all Italy was filled with vice, the Perugians suddenly entered upon a course never before thought of; after them the Romans, and at length all Italy. The fear of Christ exerted upon the people so strong an influence that men of noble and ignoble birth, old and young, traversed the streets of the city naked, yet without shame. Each carried a scourge in his hand, with which he drew forth blood from his tortured body, amidst sighs and tears, singing at the same time penitential psalms, and entreating the compassion of the Deity. Both by day and night, and even in the coldest winters, by hundreds and thousands, they wandered through cities and churches, streets and villages, with burning wax candles. Music was then silent, and the song of love echoed no more; nothing was heard but atoning lamentations. The most unfeeling could not refrain from tears; discordant parties were reconciled; usurers and robbers hastened to restore their unlawful gains; criminals, before unsuspected, came and confessed their crimes, &c.' But these penances soon degenerated into noisy fanaticism and a sort of trade. The penitents united into fraternities called the *Flagellants* (see preceding article), of which there were branches in Italy, France, and Germany. After the Council of Constance (1414–18) both clergy and laity by degrees became disgusted with flagellation. The Franciscan monks in France (Cordeliers) observed the practice longest.

It is not to be wondered at that a custom so absurd was so long maintained, when we remember the great advantages which the sufferers promised themselves. In the opinion of men in the middle ages flagellation imposed by the father confessors was equivalent to every sort of expiation for past sins. 3000 strokes and the chanting of thirty penitential psalms were sufficient to cancel the sins of a year; 30,000 strokes the sins of ten years, &c. An Italian widow, in the eleventh century, boasted that she had made expiation by voluntary scourging for 100 years, for which no less than 300,000 stripes were requisite. The opinion was prevalent likewise that, however great the guilt, hell might be escaped, and the honour of peculiar holiness acquired, by self-inflicted pain. The use of penance is still maintained by the Roman Catholic Church, but modern ideas have greatly modified the practice.

FLAGEOLET, a small wind-instrument, the notes of which are exceedingly clear and shrill. It is a sort of whistle with a mouth-piece. It is generally made of box or other hard wood, though sometimes of ivory, and has six holes for the regulation of its sounds, besides those at the bottom and mouth-piece, and that behind the neck. Its compass is two octaves, and a set of five different sizes is needed to take all the semitones in this range. It is not an instrument of orchestral rank, but is used in common bands as a substitute for the flute.

FLAG-OFFICER, in the British navy, is an officer whose rank entitles him to carry a flag at the mast-head of the ship in which he sails. This right is held by admirals, vice-admirals, and rear-admirals. See FLAG.

FLAG-SHIP, a ship in which an admiral, or the commander of a squadron, hoists his flag.

FLAG-STAFF in ships is generally a continuation of the top-gallant mast above the top-gallant rigging, but is sometimes, especially in guard-ships, a spar, occupying the top of the top-gallant mast, and is only of use to display the flag or pendant. When it is a continuation of the top-gallant mast it is frequently termed the *royal mast*.

FLAIL, an instrument for thrashing corn, that consists of—1, the *hand-staff*, which the labourer holds in his hand; 2, the *swiple*, or that part which strikes the corn; 3, the *caplins*, or leathern thongs, that bind the hand-staff and swiple; 4, the *middle band*, being the leathern thong that ties the caplins together.

FLAMBEAU, a light made of a thick wick covered with wax or other combustible material, and of considerable size, for carrying in the hand at illuminations, night-processions, &c.

FLAMBOROUGH HEAD, a remarkable headland on the east coast of England, Yorkshire, lat. 54° 7′ N.; lon. 0° 5′ W. It consists of a lofty range of chalk cliffs, about 6 miles long, and rising in many places to an elevation of 300 feet perpendicular above the sea. At the base of the rocks are several extensive caverns, and on the extreme point of the promontory, at a height of 214 feet above sea level, is a lighthouse, with a revolving light, visible from a distance of 30 miles. During the summer season the cliffs here are the resort of immense numbers of sea-fowl.

FLAMBOYANT, a style of Gothic architecture in use in France about the same period with the Perpendicular style in England. It was distinguished by the waving tracery of the windows, panels, &c. The church of St. Marlow, Rouen, erected 1432–1500, is said to be one of the finest specimens of this style.

FLAME, Luminosity of. Flames consist of intensely heated gases, usually mixed with incandescent solid particles. The high temperature of the gases is maintained by chemical combination that is going on between them, chemical combination being then called *combustion*. The causes of the luminosity of flame have been examined by various experimenters. In many cases it depends chiefly on the presence of incandescent solid particles. Thus common coal-gas, which affords a bright light in the ordinary way of burning it, may be burned, as in the Bunsen flame, in such a way as to give out scarcely any light. In the latter case oxygen is mixed with the gas in such quantities as to cause immediate combustion of the solid carbon particles along with the hydrogen. In the former, the supply of oxygen being limited, there is not a sufficient quantity to burn both the hydrogen and the carbon immediately; as the hydrogen has the greater affinity for oxygen it satisfies itself first, and in doing so it gives out much heat, which raises the carbon particles to incandescence. The flame of hydrogen, also, which is non-luminous, may be rendered luminous by passing the hydrogen through chlorochromic acid. The light of the flame in this case is plainly due to the presence of particles of sesquioxide of chromium, which the burning hydrogen renders incandescent. It is also observed, however, that at the tops of high mountains flames appear to burn with brilliancy very much reduced, and Frankland has shown that their luminosity depends on the pressure under which the gases are burning. Thus the photometric value of a gas flame may be reduced to only three per cent. of its original value by reducing the barometric pressure from 30 inches of mercury to 10 inches; and he has also shown that hydrogen and other non-luminous flames may be made luminous by causing the combustion to take place under increased pressure. These results have considerable importance in connection with spectroscopic observations of the flames that constitute the gaseous envelope of the sun.

FLAMEN, in Roman antiquities, a priest who was consecrated to one particular divinity; as *flamen Dialis*, the priest of Jupiter, who was the highest of all the flamens; and *flamen Martialis*, a priest of Mars, &c. The name is derived from the cap or fillet which they wore on the head. The flamens of Jupiter, Mars, and Quirinus were the *flamines majores*, and were taken from the patricians only; the others (according to Festus twelve in number, but eventually increased to fifteen) were called *minores*. When the emperors were deified they also had flamens, as the *flamen Augusti*.

FLAMINGO (*Phœnicopterus*, L.) The flamingo, although one of the most remarkable of all the aquatic tribes for its size, beauty, and the peculiar delicacy of its flesh, is by no means generally well known as regards its habits and manners. The body of the flamingo is smaller than that of the stork; but, owing to the great length of the neck and legs, it stands nearly 5 feet high. The head is small and round, and furnished with a bill nearly 7 inches long, which is higher than it is wide, light and hollow, having a membrane at the base, and suddenly curved downwards from the middle. The long legs and thighs of this bird are extremely slender and delicate, as is also the neck. The plumage is not less remarkable than its figure, being of a bright flame-coloured red in the perfect bird. The young differ greatly from the adult, changing their plumage repeatedly. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding they keep together, drawn up artificially in lines, which, at a distance, resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the rest. On the approach of danger these give warning by a loud sound, like that of a trumpet, which may be heard to a great distance, and is the signal for the flock to take wing. When flying, they form a triangle. Their food appears to be molluscs, spawn, and insects, which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the crook in their beak; while slippery prey is secured by the denticles on the hind part of the very large tongue. They breed in companies in inundated marshes, raising the nest to the height of their bodies by heaping up the mud with their feet into a hillock, which is concave at the top. On the top of this pyramid the female lays her eggs, and hatches them by sitting on them with her legs hanging down, like those of a man on horseback. Dampier, who describes the ridiculous posture of these birds while fulfilling this office, justly supposes it must arise from the great length of their limbs, which renders it impossible to fold them under their bodies, as in other birds. The young, which never exceed three in number, do not fly until they have nearly attained their full growth, though they can run very swiftly a few days after their exclusion from the shell. They occur in all the warm countries of the globe, sometimes visiting the temperate shores. This bird was held in high repute among the luxurious Romans; and Apicius, so famous in the annals of gastronomy, is recorded by Pliny to have discovered the exquisite relish of the flamingo's tongue, and a superior mode of dressing it. Dampier and other travellers speak variously respecting the flesh of this bird. Although some esteem the flesh very highly, and consider that of the young equal to the flesh of the partridge, others say that it is very indifferent. In some parts these birds are tamed, principally for the sake of their skins, which are covered with a very fine down, and applicable to all purposes for which those of the swan are employed. When taken young they soon grow familiar, but they are not found to thrive in the domesticated state, as they are extremely impatient of cold. They are caught by snares, or by making use of tame ones. The method is to drive the latter into places frequented by the wild birds, and to lay meat for them there. No sooner do the wild flamingoes see the others devouring this food than they flock around to obtain a share. A battle ensues between the parties, when the bird-catchers, who are concealed close by, spring up and take them. The species are *P. antiquorum* (Temm.), of a rose-colour,

with red wings, having the quills black. It inhabits the warm regions of the old continent, migrating in summer to Southern, and sometimes to Central Europe. *P. ruber* (L.); deep red, with black quills. This species is peculiar to tropical America, migrating in summer to the southern, and rarely to the middle states. A smaller species, *P. parvus*, is found in South Africa.

FLAMSTEED, JOHN, the first astronomer-royal of England, was born at Denby, near Derby, on 19th August, 1646. He began his mathematical and astronomical studies at an early age, and also showed a talent for constructing instruments. About 1667 he wrote a tract showing the true causes of the equation of time. About 1670 he visited London and Cambridge, where he had interviews with Newton and Barrow, and entered himself of Jesus College. In 1674 he took the degree of M.A., and in 1675 he took orders in the church. He still continued his astronomical observations, and was in constant correspondence with scientific men. He found the astronomical tables of the day to contain large errors, and was anxious to make more detailed and accurate observations. This having come to the knowledge of Charles II., he was appointed astronomical observator to the king, and carried on his observations at the Queen's House at Greenwich, until the observatory was built for him in 1676. Here he passed the remainder of his life amidst his astronomical labours, which are considered as the foundation of modern practical astronomy. He was so ill supported that he had to teach for his own support, and erect instruments at his own expense. In 1684 he was presented with a small living, and his father dying in the same year, he was enabled to provide some needful apparatus at his own expense, which, on his death, was claimed by the government as public property. He died 31st December, 1719. Little was known of Flamsteed but from his observations, until Mr. Baily, in 1832, discovered a collection of his letters, which have been published by the Lords of the Admiralty. They disclose a protracted quarrel between him and Newton. Flamsteed had for a considerable time supplied Newton with observations of the moon's places for his lunar theory. Their correspondence was broken off about the time of Newton's appointment to the mint, the latter appearing not to consider the information he received as satisfactory. In 1698 Newton again applied to Flamsteed, who supplied him with corrections of former observations. Newton was afterwards appointed by Prince George of Denmark one of a committee intrusted with the publication of Flamsteed's observations. This committee, after the astronomer had given up his manuscripts to them, appear to have treated him with little courtesy or regard. They broke the seal of a manuscript containing a part of his catalogue of stars without his consent. Newton's answer when charged with this by Flamsteed was that it was done by the queen's command. On the death of Prince George Flamsteed had to commence a lawsuit against Newton to recover some of his manuscripts. Such is an outline of the story as told by Flamsteed.

FLANDERS (French, *Flandre;* German and Flemish, *Flandern;* Dutch, *Vlaanderen*), a former country or district of Europe, now included in Holland, Belgium, and France. It stretched from the Schelde, below Fort Lillo, west along the Hond, or West Schelde, and west-south-west along the German Ocean to the entrance of the Straits of Dover, near Gravelines, and was bounded E. by the duchy of Brabant, S. by Hainaut, and W. by the French provinces of Artois and Picardy. The origin of the name is unknown. It occurs for the first time, but in a very restricted sense, in the seventh century. The erection of the territory into a county took place in the ninth century, and was made by Philip the Bold, king of France, in favour of his son-in-law, Baldwin, of the Iron Arm. It afterwards passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and is now included in departments Nord and Ardennes; and by the conquests of the Dutch in the north, who succeeded in including the most northerly portion of it in the province of Zeeland. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium.

FLANDERS, EAST (French, *Flandre Orientale*), a province of Belgium, bounded N. by Holland, E. by the provinces of Antwerp and Brabant, S. by Hainaut, and W. by West Flanders; length, north to south, 34 miles; central breadth, east to west, 32 miles; area, 1157 square miles. The surface forms an extensive plain, sloping gently eastwards. It wholly belongs to the basin of the Schelde, which by itself, its tributaries, and canals connected with them, furnishes ample water communication. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skilfully cultivated that it has the appearance of a vast garden, and presents one of the richest rural landscapes which anywhere exists. The Pays de Waes, included almost wholly in the arrondissement of Termonde, is regarded as one of the most fertile and populous spots in Europe. The principal crops are wheat and flax, but almost all the plants which can be grown under the same latitude are cultivated with success. The domestic animals, particularly horses and cattle, are of excellent breeds. Dairy husbandry is particularly attended to. Sheep are not numerous. There are no forests properly so called, but owing to the general practice of planting hedge-row trees, there is no want of wood. In general, however, it consists of poplar and other soft-wood trees, and makes only indifferent timber. There are no minerals of any value, but manufactures have made great progress, and all the ordinary, as well as the fine tissues of wool, cotton, and flax, are well and largely made. There are also numerous tanneries, breweries, distilleries, soap-works, roperies, sugar and salt refineries, &c. The trade includes, in addition to these articles, flax, hops, and oil. For administrative purposes the province is divided into six arrondissements—Gand, or Ghent, the capital; Alost, Audenarde, Termonde, St. Nicolas, and Eecloo. Pop. (1870), 837,726.

FLANDERS, WEST (French, *Flandre Occidentale*), a province of Belgium, bounded N. and N.W. by the German Ocean, W.S.W. and S. by France, S.E. by the province of Hainaut, E. by East Flanders, and N.E. by Holland; greatest length, north-north-east to south-south-west, 54 miles; greatest breadth, 48 miles; area, 1248 square miles. The surface is generally flat, but a few low hills occur in the south and east, and a range of sand hills or downs lines the greater part of the coast. The south-eastern portion of the province belongs to the basin of the Schelde, which, forming the boundary between it and Hainaut, receives part of the drainage directly, and the remainder by the Lys; but the far larger part of the province sends its waters directly to the German Ocean by a number of small streams, of which the Yperlee is the only one deserving of notice. The others are chiefly employed in feeding canals. Much of the soil is naturally sandy and poor, but the untiring industry of the inhabitants has converted the far greater part of it into fertile plains. Large tracts of moor, however, still exist and cannot well be dis-

pensed with, as they form the principal source of fuel. The most important crops are flax, both abundant in quantity and excellent in quality; oats, barley, hops, oil-seeds, tobacco, madder, and chicory. The cattle, of all sorts, are of excellent breeds; and fish, poultry, and game abound. The most important branch of industry is linen, ordinary and damask. Great quantities of lace also are made, and there are numerous breweries, distilleries, tanneries, dye-works, oil-works, soap-works, salt and sugar refineries, &c. For administrative purposes the province is divided into eight arrondissements—Bruges, the capital; Courtrai, Ypres, Furnes, Thielt, Roulers, Ostend, and Dixmude. Pop. in 1870, 668,976.

FLANK (French, *flanc*), in fortification, that part of a work which affords a lateral defence to another. In a bastion the flanks are those lines which join the central wall. In tactics flank signifies the outer extremity of the wing of an army; and it is one of the most common manœuvres to turn this point. The enemy is then obliged to withdraw his flank, therefore to change his front, and is thus exposed to a defeat. This manœuvre is called flanking. A bold, but not always practicable manœuvre, to prevent the consequences of this attempt, is that of turning the opposite flank of the enemy who makes it. This is called outflanking. To attempt to turn both flanks of an enemy is generally condemned as bad tactics. The word flank is used in military affairs in many other ways, which are easily understood from the instances given, as the flank files or companies of a body of troops.

FLANNEL, a woollen fabric of loose texture, with a soft nap.

FLANQUEURS (from the French), cavalry scouts, employed partly to observe, partly to harass the enemy. This name is used in many of the European armies.

FLAT, a character or sign in music, used for lowering the pitch of a note or succession of notes. See MUSIC.

FLAT, a level ground lying at a small depth under the surface of the sea; otherwise called a *shoal* or *shallow*.

FLAT FISH, the popular name of the family Pleuronectidæ, including the sole, plaice, turbot, halibut, brill, and others. See PLEURONECTIDÆ.

FLATHEAD INDIANS, tribes established on both sides of the Columbia River, North America, to a distance of many miles from its mouth. They are commonly of diminutive stature and badly made, with a wide mouth and thick lips, nose thick and nostrils large. But the most remarkable feature is the almost universal flattening of the head by various mechanical contrivances, a constant pressure being applied to the skull of the infant during the first four or eight months. It does not appear that this operation has any effect in diminishing the capacity of the cranium, or the whole volume of brain.

FLAVINE. American flavine is a yellow or orange dye-stuff, got from quercitron bark, and said to be the same as quercitrin; but, according to Bolley, it is not constant. English flavine is a lake precipitated from a solution of the bark. Flavine, though it varies a good deal, is largely employed for dyeing yellow and orange, especially on wool or silk. It is mordanted with tin.

FLAX (*Linum usitatissimum*) has been cultivated from remote antiquity throughout a great part of Europe, Asia, and the north of Africa, for various purposes. Its native country is not known with certainty, though, according to Olivier, it is found wild in Persia. The root is annual; the stem slender and frequently simple, from 18 inches to 2 feet high; the leaves alternate, entire, and lanceolate or linear; the flowers blue and pedunculate, consisting of five petals, and succeeded by capsules of ten cells, each cell containing one seed. This plant is cultivated principally for the fibres yielded by the bark, of which linen cloth is made. The use of this article is so ancient that no tradition remains of its introduction. The ancient Scandinavians and other barbarous nations were clothed with linen. The mummies of Egypt are enveloped with it, and immense quantities are still made in that country, especially about the mouths of the Nile; and it is worn almost exclusively by the inhabitants. Syria, Barbary, Abyssinia, and other places are supplied from Egypt. Italy also receives large quantities from the same country. The use of linen passed from Egypt into Greece, and afterwards into Italy. Besides forming agreeable and beautiful apparel, the rags, after being converted into paste, are made into paper.

The seeds of the flax are mucilaginous and emollient, and an infusion of them is often used as a drink in various inflammatory disorders; they also yield an oil well known in commerce under the name of *linseed-oil*, which differs in some respects from most expressed oils, as in congealing in water, and not forming a solid soap with fixed alkaline salts. This oil has no remarkable taste, is used for lamps, sometimes in cookery, and also forms the base of all the oily varnish made in imitation of China varnish. It is much employed in the coarser kinds of painting, especially in situations not much exposed to the weather. Equal parts of lime-water and linseed-oil form one of the best applications for burns. The cakes of seed remaining after the oil is expressed are used for fattening cattle and sheep. Flax-seed has been substituted for grain in times of scarcity, but it is heavy and unwholesome.

In Egypt flax is sown about the middle of December, and is ripe in March. In Europe and in America it is generally sown in the spring, from March to May; sometimes, however, in September and October. In a dry and warm country it is better to sow in autumn, as autumn and winter favour its growth, and it acquires strength enough to resist the drought, should there happen to be any in the spring. On the other hand, in cold and moist countries, sowing should be deferred till late in the spring, as too much moisture is hurtful. A light soil is the most suitable, though good crops are raised both on mossy and clayey grounds. As it appears to degenerate when repeatedly sown without changing the seed, it is usual, in some countries, to import the seed from the north of Europe, particularly from Riga, which affords the best. The American seed also bears a high reputation, and in Ireland is preferred for the lighter soils, and the Baltic for the more clayey. In general, however, in order to prevent its degenerating, it is sufficient to change the soil frequently by sowing in the heavier lands the seeds ripened in the lighter, and the reverse.

There are three varieties of flax: the first produces a tall and slender stem, with very few flowers, ripens late, and affords the longest and finest fibres; the second produces numerous flowers, and is the most proper for cultivation where the seed is the object, but its fibres are short and coarse; the third is the most common, and is intermediate between the other two. It is important not to mix the seeds of these three varieties, as they ripen at different periods, and besides, the first should be sown more closely, and the second at greater intervals than the third. When it is a few inches high it should be freed from weeds, particularly from the Cuscuta or dodder, a parasitical plant, consisting of yellowish or reddish filaments, and small white flowers: all the stems which have this plant attached to them should be pulled up

and burned. To prevent its lying on the ground it is usual with some to stretch lines across the field, intersecting each other, and fastened at the intersections. As soon as it begins to turn yellow, and the leaves are falling, it is pulled, tied together in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth, or by passing the stems through an iron comb. The process of removing the seeds is called *rippling*. The stems, after being placed even at the base, are again tied together in bundles for *retting*, as it is called—a process which is necessary to facilitate the separation of the fibres, and which is accomplished in three different manners: 1st, on the surface of the ground (*dew-retting*), which requires a month or six weeks; 2d, in stagnant water (*water-retting*), which is the most expeditious manner, as only ten days are necessary; but the fibres are of inferior quality; 3d, in running water, for which about a month is necessary. The finest fibres are produced by this latter mode, and certain rivers are considered as possessing advantages over others. Whatever method be made use of, it is necessary to turn it every three or four days. After this process it is taken out, dried, and is ready for having the fibres separated from the woody part of the stem.

In order that this may be accomplished the flax has to pass through one or two operations. The first of these is called *breaking*, which is very frequently performed by hand, but also by machinery. The apparatus for hand-breaking consists essentially of two parts, a horizontal wooden framework resting upon feet, and having spars, with openings between them extending longitudinally from end to end of it; above this rests a corresponding movable framework, hinged at one end to the fixed framework, and having spars fitting into the intervals between those of the latter. In working the apparatus the operator lifts the upper frame with his left hand, and with his right places a parcel of the flax-stalks between the two frames, shifting it gradually across the lower, and giving it successive blows with the upper. The woody matter is thus perfectly broken and fitted for separation by the process of *scutching*. The process of breaking the flax is, however, more perfectly and easily performed by machinery. The essential parts of a machine for the purpose consist of three deeply-grooved rollers connected together, the one above the other. The dry flax-stalks are introduced between the upper and middle one; they are guided round the back of the middle roller, and come out again over an inclined table between the middle and lower roller. The flutings or longitudinal groovings break the woody part of the stalk more perfectly and uniformly than any manual skill can do it. After being thus broken the flax is ready for *scutching* or *swingling*, and here again the hand process has been successfully imitated by machinery. In the manual process a flat, thin blade of wood, attached to a handle, and presenting a sharp edge, is used; the flax is laid in successive handfuls over an upright stand, presenting nearly a horizontal edge, on which the flax is rested, and successive blows are given with the edge of this blade upon the projecting part of the handful, which is turned about so that every part of it may be presented in turn. In the scutching-machine a number of such blades are carried round at the ends of the radii of revolving wheels, and as they pass by edges over which the flax may be laid, the process is precisely similar in method and result to that already described. The flax is next *heckled*, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See LINEN.

FLAX, NEW ZEALAND (*Phormium tenax*). The fibres of this plant are used by the inhabitants of New Zealand for the making of cord and for weaving into cloth, instead of hemp and flax. It is a tall and handsome plant, belonging to the natural order Liliaceæ, with a fleshy tuberous root and numerous leaves, which are radical, ensiform, from 3 to 6 feet in length, of a brilliant green above, but whitish beneath, and disposed in two rows on opposite sides of the stem. The flowers are yellow, and borne in great numbers on a branched stalk, each branch supporting from ten to twelve flowers. It was discovered by Sir Joseph Banks during Cook's first voyage, and abounds in New Zealand between lat. 34° and 47° S. The preparation of the leaves consists merely in tearing them into strips, scraping them, and beating and twisting them for a long time in water, till the fibres are separated from the cellular tissue. The strength and tenacity, along with the beautiful silky gloss of the fibres of this plant, occasioned its introduction into Europe, where, in the district of Provence in France, it is grown with considerable success. From numerous experiments made by Labillardière it appears that, taking the mean strength of the fibres of hemp at $16\frac{1}{3}$, the relative strength of the fibres of the New Zealand flax is $23\frac{5}{11}$, that of common flax $11\frac{3}{4}$, and that of silk 34. To the use of New Zealand flax, however, the fibres of which are thus only surpassed in tenacity by those of silk, an insurmountable objection exists. It has been found that the prolonged action of humid warmth, and more especially washing, disintegrates the cellular matter, reducing the fabric to the condition of tow, and causing ropes made of it to break readily.

FLAXMAN, JOHN, an eminent English sculptor, was born at York in 1755. His earliest notions of art were derived from casts in the shop of his father, who sold plaster figures, from many of which he made models in clay. In 1770 he was admitted a student of the Royal Academy, where he prosecuted his studies with great diligence. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius, which have been much admired. While in Rome he executed those fine illustrations of Homer, Dante, and Æschylus, which at once made him known in Europe. The illustrations of Homer and Æschylus were published at Rome in 1793; and the former were republished, with additions, in London, 1805. Those of Dante were also published in London in 1806. When he commenced his designs from the Greek poets he confined himself almost entirely to copies of subjects on the Greek vases. In 1794 he returned to England, where he was diligently occupied with his professional pursuits until his death in 1826. He had been elected an associate of the Royal Academy in 1797, royal academician 1800, and in 1810 was appointed professor of sculpture to that institution. His lectures have been published since his death (8vo, London, 1829, fifty-two plates). His monument of Lord Mansfield in Westminster Abbey is considered one of the finest public monuments in England. His monuments to Collins at Chichester, to Earl Howe in St. Paul's, and to Sir Joshua Reynolds, are among his best works in sculpture, which are, however, accused of being somewhat deficient in softness, finish, and grace. He also executed statues of Washington, Sir W. Jones, Pitt, Lord Nelson, &c., and some colossal groups. His illustrations of Homer, Æschylus, and Dante, were republished in Germany and in Paris.

FLEA (*Pulex*). This familiar insect is the only genus of a family which constitutes the order Aphaniptera, so called because the wings are inconspicuous, being reduced to scales which are applied to the sides of the thoracic rings. The small head

and large abdomen give a look of disproportion to an insect which nevertheless is of very great activity. The last pair of limbs are greatly elongated, and serve for springing. The proboscis consists of the serrated mandibles and the penetrating organ, which are inclosed in a half tube formed by the underlip. The tolerably numerous species of this genus live as gregarious parasites on mammalia and birds, feeding on their blood. The common flea (*P. irritans*) is diffused over the whole earth, but abounds particularly in warm and dry climates, where it forms a great pest, as in the Levant, Chili, Peru, Buenos Ayres, the Cape of Good Hope, and Australia. It lays about twenty eggs, in the chinks of the floor or furniture of rooms, or among the hairs of domestic animals. In six to twelve days the eggs produce little footless maggots, which in eight days are changed to pupæ. Nothing but great cleanliness, and, above all, careful washing and scrubbing of floors, can banish the flea entirely, or greatly limit its numbers. The sand-flea (*P. penetrans*), called also *chigoe*, is much smaller, and is found chiefly in the West Indies and South America, on dusty hot spots in the vicinity of houses. The female inserts herself under the skin of the toes, the soles or balls of the feet in man, and also in house-dogs, and sometimes grows to the size of a nut when her abdomen is distended with eggs. The swelling produces very painful sensations, and if neglected usually terminates in serious ulcers. The dog-flea (*P. canis*) is nearly black, and has large eyes. It is found on dogs, cats, &c.

FLÈCHE, La, a town in France, in the department of Sarthe, in a beautiful valley on the right bank of the Loir, 25 miles south-west of Le Mans. It consists of wide and handsome streets, was once defended by a castle situated on an island in the river, now in ruins, but once celebrated for its strength; and has a military college, occupying part of the extensive buildings of a former college belonging to the Jesuits; a fine old Byzantine church, the *flèche* or spire of which gives name to the town; a town-house, court-house, and hospital. At the harbour in the Loir, near which there is a fine walk bordered with elms, some trade is carried on in grain, fruit, and cattle. Pop. 7077.

FLECKNOE, Richard, an English poet and dramatic writer, contemporary with Dryden, and chiefly memorable for having had his name gibbeted by that satirist in the title of his invective against Shadwell. He died in 1678.

FLEECE, Golden. See Argonauts and Jason.

FLEECE, Order of the Golden, one of the oldest and most honourable orders in Europe, was established by Philip III. of Burgundy, surnamed the Good, January 10, 1429, at Bruges, on the occasion of his marriage with his third wife, Isabella, daughter of King John I. of Portugal. In the beginning of the statutes of the order Philip says he took the name from the golden fleece of the Argonaut Jason, and that the protection of the church was the object of the order. He declared himself grand-master, and ordered that this dignity should be hereditary in his successors in the government. The decoration of the order is a chain composed of flints and steels alternately, in the middle of which the golden fleece is fastened. Annual chapters were to be held, when the majority was to decide on the admission of new members. But several of the first statutes were changed. Philip himself increased the number of knights from twenty-four to thirty-one; Charles V., his grandson, to fifty-one. The last chapter was held in 1559 at Ghent. Since that time the monarch has made knights of the Golden Fleece according to his pleasure. When, after the death of Charles V., the Burgundian possessions and the Netherlands fell to the Burgundian-Spanish line of the house of Austria, the kings of Spain exercised the office of grand-master of the order; but when the Emperor Charles VI. received, after the war of the Spanish Succession, the Spanish, afterwards the Austrian, Netherlands, he insisted upon being held as the grand-master of the order. The dispute was not settled, and the order at present is conferred both at Vienna and Madrid. The chain is now the decoration only of the grand-master; the other knights wear a golden fleece on a red ribbon. The Spanish golden fleece differs from the Austrian by the inscription *Pretium laborum, non vitæ*, upon the steel.

FLEET, a general name given to the royal navy: also any number of ships, whether designed for war or commerce, keeping in company. A fleet of ships of war is usually divided into three squadrons, and these, if numerous, are again separated into subdivisions. The admiral commands the centre, the second in command the vanguard, and the third the rear.

FLEET MARRIAGES. These were a kind of irregular marriages performed without license by needy clergymen, who were ready to marry any couples that came before them for a fee proportioned in amount to the circumstances of those who were married. Sometimes a dram of gin was thought sufficient; at other times the fee was rather exorbitant. They were called Fleet marriages because they were usually performed by clergymen who, for debt or any other reason, were compelled to live within the bounds of the Fleet Prison, and who, having neither money nor character to lose, paid little regard to the penalties imposed by the legislature for the performance of such marriages, and were quite beyond the reach of any punishment that might be inflicted by the church. Before 1616 marriages of this nature were performed by the incumbents of Trinity Minories and St. James', Duke's Place, who believed themselves to be beyond the jurisdiction of the Bishop of London; but one of the incumbents of St. James' having been in that year suspended from his office for this offence, the incumbents of these churches no longer ventured to continue the practice, and the trade was taken up by the clerical occupants of the Fleet Prison. From this date till 1754 Fleet marriages were frequent, and the most extraordinary couples were often conjoined in matrimony without the slightest scruple on the part of those who took part in the ceremony either as performers or witnesses. The patrons of the Fleet clergy were by no means confined to the lower ranks of society. People of all classes, in some cases even belonging to the ranks of the nobility, came to solicit their services; and when there was any lack of voluntary custom it would seem that the priests of the Fleet did not hesitate to use means to entrap people into being married against their will, and even to use threats and violence in order to compel them to submission. Miss Hawkins, in her Anecdotes, records a case which will illustrate the extraordinary nature of some of the Fleet marriages. It is the case of Lady Lucy Pitt, daughter of the Earl of Londonderry, who at the age of fourteen was married to a boy belonging to Westminster School, her cousin, who was a little older than herself, at the same time marrying his brother. It seems that on this occasion the clergyman who united the couples exhibited unusual scrupulosity, as he objected to marry Lady Lucy on account of her extreme youth. His scruples, however, were not very strong, as they were overcome by Lady Lucy playfully remarking that her cousin might be married first, and then lend her her gown, which would give her a more womanly appearance. Miss Hawkins also relates that the two brides were so undecided in their minds that they had not finally

fixed their choice of husbands, and that they actually exchanged bridegrooms immediately before the performance of the ceremony. Fleet marriages were finally put a stop to by a bill brought into Parliament in 1753, rendering such marriages illegal and invalid. The bill met with violent opposition, especially on the part of Henry Fox, who had himself been married after this irregular fashion; but it ultimately became law, and from March 25, 1754, such marriages were no longer recognized.

FLEET PRISON, once a celebrated prison in London till it was pulled down in 1845, having previously been abolished as a prison by act 5 and 6 Vict. cap. xxii. It stood on the east side of Farringdon Street, and on this site a prison was in existence as early as the twelfth century, which took its name of Fleet Prison from a brook or ditch that used to flow close by, and which was so called from the rapidity of its course. It was early used as a place of confinement for debtors, and was used as such down to the period of its abolition. It was at one time in great repute for the clandestine marriages contracted within its walls, hence called Fleet marriages. The building which was demolished in 1845 had been erected about the end of the eighteenth century, after the burning of the old one in the Gordon Riots in 1780.

FLEETWOOD-ON-WYRE, a seaport and watering-place in England, in the county of Lancaster, on the Wyre, near its entrance into Lancaster Bay, 18 miles north-west of Preston, with which it is connected by railway, joining the London and North-Western line. This place has sprung up since the year 1836, and is now a considerable town, containing a number of regular streets, well lighted with gas. It has a handsome church, a market-house, lighthouse, custom-house, and bonding warehouses; a school of musketry and barracks. There is a large public school at Rossall, near Fleetwood. The harbour is safe and commodious. In 1872 the total number of vessels entered at this port was 707, of 186,991 tons burden, and the total number cleared was 636, of 185,058 tons. Pop. in 1871, 4428.

FLEMING, JOHN, D.D., a celebrated Scottish naturalist, born at Kirkroads, near Linlithgow, in 1785; died at Edinburgh, Nov. 18, 1857. Having entered the church he was early ordained to the pastoral charge of the parish of Bressay, in Shetland, and soon after founded his fame as a naturalist by publishing a Report on the Economical Mineralogy of the Orkney and Zetland Islands. In 1822 he published at Edinburgh the first of his important works, entitled the Philosophy of Zoology. This was followed in 1828 by the British Animals, a work whose merits have been acknowledged by the most eminent naturalists, and to which subsequent productions of a similar description have all been more or less indebted. In 1834 he was appointed professor of natural philosophy at King's College, Aberdeen, which he quitted in 1845, to accept the professorship of natural science in the New College, Edinburgh. This post he held till his death. Besides the works already mentioned, Dr. Fleming was the author of the article on Mollusca, contributed in 1837 to the Encyclopædia Britannica; the Temperature of the Seasons (1851); the Lithology of Edinburgh (1858); and a large number of papers on zoology, palæontology, and geology contributed to the Encyclopædia Britannica, the Edinburgh Encyclopædia, the North British Review, &c. Throughout his whole scientific career the chief aim of Dr. Fleming was to be the strict interpreter of nature, and he carefully avoided every appearance of hypothesis. The estimation in which he was held by contemporary naturalists is shown by the declaration of Professor Agassiz, that 'he should have been abundantly recompensed for his visit to England had he gained no more by it than what he saw and learned during his few hours' visit to Dr. Fleming.'

FLEMISH LANGUAGE AND LITERATURE. See NETHERLANDS.

FLEMMING, PAUL, one of the best German poets of the seventeenth century, was born October 17, 1609, at Hartenstein, in the district of Schönburg. After a good foundation for his education had been laid by private instruction at home, he went to the royal school at Meissen, and from thence to Leipzig, where he studied medicine. The confusions of the Thirty Years' war obliged him, in 1633, to go to Holstein, where the Duke Frederick was on the point of sending an embassy to his brother-in-law, the Czar Michael Fedorovich. Flemming, full of ardour and enthusiasm, sought a place in the ambassador's suite, obtained it, performed the journey with him, and in 1634 returned safe to Holstein. Immediately after the duke resolved to send a still more splendid embassy to Persia, to obtain for his states some commercial privileges. Flemming resolved to undertake this journey also, which promised him a large stock of information. This expedition lasted nearly four years, from Oct. 1635 to Aug. 1639. In Revel Flemming fell in love with the daughter of a respectable merchant, and as it was his previous intention, after returning to his country, to settle as a practising physician in Hamburg, he went in 1640 to Leyden, where he took his degree. He had but just returned to Hamburg, when he was snatched away by death, April 2, 1640, in the flower of life. In his songs and sonnets, sacred and other poems (Jena, 1642 *et seq.*), an amiable enthusiasm is joined to deep and warm sensibility. His longer poems describe the adventures of his journey with great spirit and power, and other accidental events with originality and liveliness, and all his works bear the impress of genius. A selection from his poems is contained in the Library of German Poets of the seventeenth century, by W. Müller, three volumes (Leipzig, 1822).

FLENSBURG, formerly *Flensborg*, a town in Prussia, in the province of Schleswig-Holstein, at the west end of the fiord of same name, 20 miles N.N.E. of the town of Schleswig. It was a place of importance as early as the twelfth century, but subsequently suffered much from wars and conflagrations. It is again prosperous, and is now the most important town in Schleswig. The industrial establishments include sugar-refineries, tobacco-factories, soap-works, foundries, breweries, distilleries, a rice-mill, palm-oil manufactory, and a steam-bakery; and the trade, partly with the West Indies, is considerable. In 1848 Flensburg was seized by the Holsteiners, and its environs became the scene of hostile operations. In 1866 it fell to Prussia, along with the duchy of Schleswig-Holstein. Pop. in 1871, 21,325.

FLERS, a town in France, in the department of Orne, 37 miles north-west of Alençon. It contains the remains of a fine old castle, built of granite, in good preservation, and has manufactures of linen, damask, fustian, and particularly of ticking, which, in the town and neighbourhood, employs many thousands of hands. It has also bleach-works, &c. Pop. 10,260.

FLESH, the muscles of animals constructed out of a variety of tissues. These consist chiefly of fibrin, with albumen, gelatin, hæmatosin, fat, phosphate of sodium, phosphate of potassium, phosphate and carbonate of calcium, sulphate of potassium, and chloride of sodium. The solid part is, besides, permeated by an acid fluid, called flesh-juice. It has a red colour, and contains dissolved a number both of organic and inorganic substances. The organic matter consists of

albumen, casein, creatine and creatinine, inosic, and several other acids; the inorganic, of alkaline sulphates, chlorides, and phosphates, with lime, iron, and magnesia. The juice is best extracted by water, and this cold extract, with the addition of some salt and a few drops of hydrochloric acid, is recommended by Liebig as a highly nutritious drink for invalids. The extract must be made with cold water; if hot water be used the albumen coagulates on the outside of the flesh, and prevents the solution of the juice. Heating the cold extract also spoils it, as the albumen and other nutritious parts are precipitated.

FLESH-FLY. See FLY.

FLETA, the name given by the author to a commentary upon English law, for the reason that it was written in the Fleet Prison. The author's name is unknown, and the date of the work can only be inferred from internal evidence, but this makes it pretty certain that it was composed about the middle of the reign of Edward I., for it contains a reference to the statute Westminster II., which was passed in the thirteenth reign of that monarch (1285), and has no reference to the acts passed in the latter years of the same reign. The work is divided into six books, and is intended to form a complete but concise treatise on the state of the law at the time at which the author wrote. He follows Bracton very closely, but supplements and corrects him in accordance with the changes made by Parliament since the appearance of Bracton's work, and he makes large omissions for the sake of brevity. The procemium of the work is copied from Glanville.

FLETCHER, the name of two English poets, brothers to one another, and cousins of John Fletcher, the dramatist.—1. GILES, the author of Christ's Victory. He died in 1623, but the date of his birth is not known. It is not known even whether he was the elder or the younger brother. His poem was first published in 1610. A new edition appeared in 1824.—2. PHINEAS, author of the Purple Island and Piscatory Eclogues. He was born about 1584, and died about 1650. The former is an allegorical description of man, founded upon an allegory in the ninth canto of the second book of the Faerie Queene. It is composed in the Spenserian manner, and is not without passages of strong fancy and beauty of description, clothed in smooth and elegant verse. In the first five cantos, however, the reader loses the poet in the anatomist—a character but little adapted to the handling of poetry. When, however, he steps from the physical to the intellectual man, he not only attracts, but secures attention by a profusion of images, many of which are distinguished by much boldness of conception and brilliancy of colouring. His Piscatory Eclogues have considerable sweetness of versification, and much descriptive elegance. Milton was indebted to both of these poets in different passages of the Paradise Lost and Paradise Regained.

FLETCHER, ANDREW, a Scottish political writer and patriot, was the son of Sir Robert Fletcher, of Saltoun. He was born in 1653, spent some years in foreign travel, and first appeared in public life as commissioner for East Lothian in the Scottish parliament. Having distinguished himself in opposition to the court he deemed it prudent to retire to Holland; and on his non-appearance to a summons from the lords in council he was outlawed. In 1683 he came over to England to take measures with the friends of liberty against the designs of James II.; and in 1685 he joined the enterprise of the Duke of Monmouth. While on this expedition, having killed in a quarrel another partisan in the same cause, who had insulted him, the duke dismissed him. He then repaired to Spain, and afterwards to Hungary, where he distinguished himself in a war against the Turks. He subsequently joined the Scottish refugees in Holland, and when the Revolution of 1688 took place he returned to England with William of Orange, resumed possession of his estate, and became a member of the convention for settling the new government in Scotland. In 1698 he printed A Discourse on Government in Relation to Militias; and also, Two Discourses Concerning the Affairs of Scotland. In 1703 he opposed a vote of supply until 'the house should consider what was necessary to secure the religion and liberties of the nation on the death of the queen' (Anne), and carried various limitations of the prerogative, forming part of the Act of Security rendered nugatory by the Scottish union, which he vehemently opposed. He died in London in 1716. His tracts and some of his speeches are published in one volume, octavo, entitled The Political Works of Andrew Fletcher, Esq. (London, 1737).

FLETCHER, JOHN. See BEAUMONT AND FLETCHER.

FLEUR-DE-LIS. Nothing whatever is known of the origin or true nature of this heraldic emblem. According to some it represents the flower from which it takes its name, either the white lily of the garden or the iris; according to others it represents the offensive part of a halberd, according to others a bee or a toad. What is known about it amounts simply to this, that the flower bearing this name has been recognized at all times and among all peoples as a symbol of greatness and sovereignty, and that from the throne it passed to the nobility, and from them to still lower ranks. The fleurs-de-lis, in the form in which they are used at the present day as a blazon in heraldry, are much older than the Bourbons, and they have never been exclusively the emblem of that house. Some of the great families of France (most of whom are now extinct) bore them on their shields from the very commencement of the practice of blazoning, and a large number of families in Germany, Sweden, Switzerland, the Low Countries, and other parts of Europe, can be shown to have borne the fleurs-de-lis on their coats of arms from the twelfth or the thirteenth century, that is, from the time when the language of heraldry came into use. The great popularity of this emblem in France dates from the thirteenth century. The royal coat of arms of France consisted of three golden lilies on a blue ground, with the device, '*Lilia neque nent neque laborant.*' The shield of France was anciently, in heraldic language, *semé de fleurs-de-lis*, that is, bore this emblem scattered over the shield. It is commonly believed that it was Charles V. (1364–80) who reduced the number to three; but this is disproved by the fact that two seals have been preserved, the one belonging to Philip the Fair (1285–1314), the other belonging to Philip of Valois (1328–50), both of which bear *three* fleurs-de-lis; and the town library of Rouen contains a collection of charts relating to the celebrated abbey of Savigny, to one of which, bearing the date 1212, a seal is attached, which is still in a state of perfect preservation, representing *three* fleurs-de-lis exactly similar to those used on the shield of France. Hence it appears that the use of this emblem in a triple form is much more ancient than is usually thought.

FLEURUS, a town in Belgium, in the province of Hainaut, 7 miles north-east of Charleroi. It has manufactures of coarse woollens and flax, with some tanneries and salt-works, and a trade in agricultural produce. In the vicinity, in Aug. 1622, the Spaniards under Gonzales defeated the army commanded by Ernst von Mansfeld; July 1, 1690, the French under Marshal Luxembourg defeated the Germans under Prince Waldeck; and June 26, 1794, the French republican forces under Marshal Jourdan defeated the Austrian army. The battle of Ligny, also, is sometimes known as the battle of Fleurus,

Ligny being only about 2 miles from Fleurus. Pop. 4093.

FLEURY, André Hercule de, cardinal and prime minister of Louis XV., was born at Lodève, in Languedoc, June 22, 1653, and pursued his studies at first in the college of the Jesuits, at Clermont, whence he was removed to the College d'Harcourt, at Paris, in order to study philosophy. He was then made canon of Montpelier and doctor of the Sorbonne. At court he won general favour by his pleasing person and fine understanding; became almoner of the queen and afterwards of the king. In 1698 Louis XIV. gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. In the troubled times of the regency he knew how to retain the favour of the Duke of Orleans, by asking for no favours, and keeping clear of all intrigues. In 1717 he was admitted a member of the French Academy. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal. His ministry was a highly prosperous one. The war which he began in 1733 against Charles VI. and the German Empire, on account of the election to the crown of Poland, he ended with glory. By the peace of 1736 he added Lorraine to France. On the other hand, the war of the Austrian Succession was unfortunate for the French. Fleury died before its termination, at Issy, near Paris, January 29, 1743.

FLEURY, Claude, born at Paris, December 6, 1640, was educated in the Jesuit college at Clermont, and after beginning to practise as a lawyer, resolved to take orders. In 1672 he became the tutor of the young princes of Conti, who were brought up along with the dauphin. He was afterwards employed by Louis XIV. to educate his natural son the Count of Vermandois, after whose death in 1683 he had, under Fénelon, the second charge of the princes of Burgundy, Anjou, and Berri, and was appointed abbot of the Cistertian monastery Loc-Dieu. After completing the education of the princes he was rewarded by Louis XIV. with the priory of Argenteuil. In 1696 he succeeded La Bruyère as a member of the French Academy. In consequence of his moderate views during the strife which raged between the Molinists and Jansenists Louis XV. made him his confessor; but this situation he resigned, in consequence of his great age, a year before his death, which happened in 1723. He had procured admission into the Academy in 1696 by several important works, among which the best known are his Histoire du Droit Français, Mœurs des Israélites, Mœurs des Chrétiens, Institution au Droit ecclésiastique, Histoire ecclésiastique.

FLINT, or Flintshire, a maritime county in North Wales, consisting of two separate portions, a larger and smaller, the former having the Dee on the east, the Irish Sea on the north, and the county of Denbigh on the south and west; the latter, which is distant 6 miles s.e. from the main portion, and separated from it by the county of Denbigh, has Cheshire on the n.e., and Shropshire on all other sides. Flintshire is the smallest county in Wales, but the most populous in proportion to its extent. The larger portion is about 27 miles long, with an average breadth of 7 or 8 miles; the smaller, 8 miles, by about 5 miles broad; area, 169,162 acres, or 264 square miles. A range of hills of moderate elevation intersects the county lengthways s.w. to n.e. There are numerous well-watered and fertile valleys, including a portion of the celebrated Vale of Clwyd. The coast is in general low, and skirted by sands, in some places nearly 4 miles wide, which are dry at low water. Agriculture has made considerable advances in this county of late years, and the condition of the peasantry has much improved. The grains principally cultivated are wheat and oats. The total acreage under wheat in 1872 was 15,390, and under oats 12,042 acres. The breed of cattle is small, but they are excellent milkers. Butter and cheese are also made to a considerable extent. The county is rich in minerals, particularly lead, the mines of which are the most productive in Britain. Coal also abounds, and copper is obtained in considerable quantities. The principal smelting works are at Holywell and Mold. Manganese is also worked. Along the estuary for about 14 miles there is a complete line of works for coal, iron, copper, lead smelting, chemicals, ship-building, &c. Flint returns two members to the House of Commons; one for the county, and one for the county town of Flint and its contributory boroughs. It is divided into five hundreds and twenty-eight parishes. The Chester and Holyhead Railway, which runs all along the coast, is the chief railway of the county. Pop. in 1861, 69,737; in 1871, 76,312.

FLINT, a parliamentary and municipal borough, and seaport town, North Wales, in Flintshire, on the s.w. shore of the estuary of the Dee, 13 miles s.w. of Liverpool, at the foot of a steep hill. The houses are tolerably well built, and mostly of brick. It has a handsome parish church in the Gothic style, erected in 1848, and several chapels; a substantial guildhall and market-house; and a mechanics' institute and news-room. In the vicinity are extensive alkali works, in which the bulk of the working population are employed, and several coal-mines. There are also large works for the manufacture of copper. The shipping trade of the port is very small. A little n.e. of the town, on the shore of the estuary, stands the ancient castle of Flint, an object of some historical interest. Flint is a station on the Chester and Holyhead Railway, which passes through the town at a small elevation. The town, with several other contributory boroughs, sends a member to Parliament. Pop. in 1871, 4277.

FLINT, a variety of quartz which occurs of all colours, but generally yellowish and dark gray, commonly in a compact amorphous body. It forms nodules or layers which are usually found in limestone. It consists of 98 silica, 0·50 lime, 0·25 alumina, 0·25 oxide of iron, and 1·0 loss. Some specimens also contain organic matter, and frequently inclose small quantities of pyrites and other minerals. It scratches common quartz, but is rather brittle and has a fine conchoidal fracture. It is translucent, with a lustre between that of glass and resin. When heated it remains infusible, but becomes white and opaque, and if, when red hot, it be plunged into water it falls to pieces, and can then be ground in a mill to an impalpable powder. When struck against a hard object, such as a piece of steel, small fragments, incandescent by the friction, fly off. This, before the use of lucifer matches, was the only means of striking a light, the little fragments being allowed to fall upon a bit of tinder. The tinder-box has never been absolutely extinct, and it has of late been revived, though the form of the steel is not so handy. The light from a stream of sparks produced by making a wheel strike on a piece of flint was also employed in mines before the Davy-lamp was introduced. But its principal use, before the invention of percussion caps, was for gun-flints. The manufacture of gun-flints was exceedingly simple, and a good workman could make 1000 flints a day. The whole art consisted in striking the stone repeatedly with a kind of mallet, and bringing off at each stroke a splinter sharp at one

end and thicker at the other. The splinters were afterwards shaped at pleasure by laying the line at which it was wished they should break upon a sharp instrument, and then giving it small blows with a mallet. This manufacture, which was once largely carried on, is all but extinct. Calcined and finely ground flint is largely employed instead of sand in the manufacture of glass, and especially of porcelain. When dissolved under pressure in caustic soda it forms silicate of sodium, which is used for artificial stone-making, for coating masonry with a coating impervious to wet, and for silicious painting. See QUARTZ.

FLINT IMPLEMENTS. Such have been found of a rude form in all parts of the world, cut into various shapes, to adapt them to the various purposes for which they were intended. A sufficient account of these will be found under the headings CELTS and ELF-ARROWS.

FLOATING BATTERIES. The most notable attempt to make use of floating batteries against maritime fortresses, till the time of the Crimean war, was during the siege of Gibraltar in 1782, when batteries of this description, invented by the Chevalier d'Arçon, were employed at first with considerable effect. On this occasion, however, they turned out in the end a complete failure, being destroyed by the red-hot shot which General Elliot (afterwards Lord Heathfield) directed against them from the fort. After this failure no more attention was paid to them until Napoleon III. suggested the use of floating batteries, protected by iron plates, in attacking the Russian fortresses in the Black Sea and the Baltic. The suggestion was actually carried out, and the floating batteries then constructed proved very effective in 1855, during the operations against Sveaborg (Aug. 9–10), and Kinburn (Oct. 17), as well as on subsequent occasions. These batteries were of a retangular form, 174 feet in length, 46 in breadth, and 16½ in depth from the bottom of the hold to the deck, and they drew from 8½ to 9 feet of water. They were protected by iron plates from 3 to 4 inches thick, and carried sixteen rifled cannon of the largest calibre. They were propelled by steam, and on account of their comparatively small draught of water, could generally be brought within easy range of the object of attack. Their armour was found to be a sufficient protection against the most powerful artillery that could then be brought to bear on them, but the immense improvements that have recently been made in the construction of rifled cannon have necessitated the use of much stronger armour than was at first used, and have led to the development of these batteries into the powerful iron-clads of the present day.

FLOATING BREAKWATER. See BREAKWATER.

FLOATING DOCKS. See DOCKS.

FLOATING ISLANDS. These are sometimes seen in lakes or at the mouths of rivers, and were long considered as being among the most marvellous phenomena in nature. They are now known to be nothing else than fragments of the land broken loose from the shore, held together by the interlacing roots of trees and other plants which prevent the soil from being washed away by the action of the water; or they are accumulations of drift-wood on which earthy matter has gathered sufficient to afford nourishment to plants. Pliny the younger gives a charming description of floating islands in the Vadimonian Lake (now the Laghetto di Bassano), not far from Rome. These have now disappeared, but similar islands are still to be seen in a lake in Italy near Tivoli, as also in France in a lake near St. Omer. Loch Lomond, in Scotland, was once celebrated for its floating island, but this has now settled down and become stationary. There are still, however, several lakes both in Scotland and Ireland which have islands of this description. But perhaps the most celebrated of all are the floating gardens of Mexico, called *chinampas*, which are formed by art. These were once numerous, but are now diminishing in number, owing to the subsidence of the lake on which they exist. Scarcely less remarkable are the floating islands of the marshy valley of Cashmere, also artificial, being formed by cutting through the roots of the reeds in the marshes, so as to destroy the connection of the soil near the surface with the fixed bottom. These are used for the cultivation of cucumbers, melons, and other fruits.

FLOATING QUARTZ, a porous variety of quartz met with in Cornwall and near Paris, consisting of interlaced fibres forming a mass which floats in water by being buoyed up by the air it incloses. It contains 98 per cent. of silica and 2 of carbonate of calcium.

FLODDEN, a village in Northumberland, about 5 miles S.E. of Coldstream, near which was fought the celebrated battle in which James IV. of Scotland was defeated by the Earl of Surrey (Sept. 9, 1513). See SCOTLAND (HISTORY OF).

FLOOR TIMBERS are those parts of the ship's timbers which are placed immediately across the keel, and upon which the bottom of the ship is framed; to these the upper parts of the timbers are united, being only a continuation of floor-timbers upwards.

FLORA, the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. She is represented as a beautiful female, with a wreath of flowers on her head or in her left hand; in her right hand she generally holds a cornucopia. Her temple at Rome was situated near the Circus Maximus, and her festival, the Floralia, was celebrated from April 28 to May 1 with much licentiousness. The later Romans identified Flora with the Greek goddess Chloris. In botany, *Flora* signifies a catalogue of plants, as, in zoology, *Fauna* signifies a catalogue of animals.

FLORAL GAMES. See JEUX FLORAUX.

FLOREAL (month of flowers), the eighth month in the calendar of the French revolution. It began April 20, and ended May 19. See CALENDAR.

FLORENCE (in Italian, *Firenze*), a province of the Kingdom of Italy, in that portion of it known as Tuscany; area, about 2262 English square miles. The surface is beautifully diversified by mountains, valleys, and plains. On the north and north-east it is covered by the north Apennines, and on the east by the central Apennines and the Tuscan sub-Apennines. Inclosed by these mountains lies the beautiful valley of the Arno, watered by the river of that name, and opened into by numerous minor lateral valleys, each drained by its tributary streams. The climate is generally mild and healthy, and the soil very fertile, producing wheat, maize, beans, and all kinds of leguminous crops. The vine, olive, orange, citron, and fig thrive well in the low grounds; while the mountainous districts afford excellent pasture, admirably adapted for the rearing of sheep. The minerals include mines of copper, lead, and mercury; and quarries of marble, alabaster, and fine building stone. Pop. 766,326.

FLORENCE (Italian, *Firenze;* in old Italian and in poetry, *Fiorenza;* ancient, *Florentia Tuscorum*), a celebrated city of Italy, capital of the above province, 143 miles north-west from Rome, and 50 miles E.N.E. from Leghorn. The city is beautifully situated, nearly surrounded by hills, those on the north being of considerable altitude. It is intersected by the Arno,

which divides it into two unequal parts, the larger being on the north side of the river. The latter varies here in width from about 100 to 150 yards, and is crossed by four bridges, one of these, the Ponte della Santa Trinità, is of marble, and remarkable for its lightness and elegance; it is formed of three elliptic arches, and is adorned with statues. The Ponte Vecchio, reconstructed in 1362, consists of three arches, has a range of shops on each side of the roadway, and above a covered way that serves to connect the Pitti Palace with the Uffizi and the Palazzo Vecchio. There are, besides, two suspension bridges. All these bridges are within a few hundred yards of each other. On either side of the Arno is a spacious quay, called the Lung' Arno, a favourite lounge or promenade of the Florentines. The city was surrounded by an old wall, completed at the beginning of the fourteenth century, but now almost entirely removed. There are two fortresses on the line of the walls, one on the north and the other on the south side of the city. These defences are now wholly useless for military purposes. The streets are generally narrow, but are clean, and well paved with thick flagstones, chiselled into grooves. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures, though somewhat gloomy, in consequence, partly of a paucity of windows, and of the lower tiers of the latter being strongly guarded with iron bars. Many of these stately mansions are magnificently fitted up, and contain extensive libraries, and valuable collections of works of art. The city contains numerous piazzas or squares, the most important of which, and the centre of public life, is the Piazza della Signoria, surrounded by important buildings, and adorned with a marble fountain, and a bronze statue of Cosmo I. by John of Bologna. In this piazza is situated the Palazzo Vecchio, originally the seat of the government of the republic, and subsequently the residence of Cosmo I. It is a grand but gloomy building, with a lofty machicolated tower, the whole possessing a very distinctive architectural character. The most remarkable building in Florence, and perhaps the most remarkable of the kind in Europe, is the Duomo, or cathedral of St. Maria del Fiore, erected 1298–1474, and situated in a spacious square, nearly in the centre of the city. The dome of this stupendous building is the largest in the world, and is said to have excited at once the admiration and emulation of Michael Angelo. The walls are of brick, and its whole exterior, with the exception of the west front, which is quite unfinished, is cased with black and white marble, in alternate courses, while its floors are paved with the same material, of various colours. The Duomo was begun at the end of the thirteenth century by Arnolfo di Lapo, was continued by other successive architects, and completed in the fifteenth century by Brunelleschi, who erected its vast dome. The campanile, or bell-tower, designed by Giotto, is a square structure of great elegance, incased with marbles, in the style of the cathedral, 293 feet high, adorned with a number of reliefs representing the progress of civilization. Near the cathedral is the small octagonal church of St. John (San Giovanni), now used as the general baptistery, the three bronze gates of which, with figures in high relief, are celebrated as among the most beautiful works of the kind extant. One of these is by Andrea Pisano, the two others by Ghiberti; the latter were said by Michael Angelo to be worthy of being the gates of paradise. None of the other churches exhibit any remarkable architectural excellence, though some possess fine cloisters. In many instances their internal decorations are imposing, and they contain many valuable works of art. The church of S. Croce, the rich front of which has recently been completed in light marble from the old design, is the burial-place of many of the most eminent Tuscans, contains much fine sculpture and many interesting tombs, amongst others those of Michael Angelo Buonarotti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated with great solemnity on the six-hundredth anniversary of the birth of the poet, 14th May, 1865. The proudest boast of Florence, however, is its grand gallery (Galeria Imperiale e Reale). It occupies the upper story of a fine building, called the Uffizi, erected by command of Cosmo I., after a design by Vasari, and situated near the centre of the city. The prevailing order is the Italian or modern Doric. In its form it consists of three sides of a lengthened parallelogram, resting on a noble loggia, the internal niches of which are adorned with marble statues of celebrated Tuscans. In this gallery are contained specimens of painting and statuary by the greatest masters in these arts. In statuary, among numerous antiques may be specified the Venus de' Medici, the Apollino, the Knife-grinder, the Dancing Fawn, the Wrestlers, and the group of Niobe and her Children; and in painting, there are works by Michael Angelo, Raphael, Titian, Fra Angelico, Fra Bartolomeo, Andrea del Sarto, Correggio, Guido, and numerous others of the first names in various schools. The Pitti Palace, situated on a rising ground on the south side of the river, is an edifice almost unrivalled in its simple grandeur. Built for Luca Pitti, the powerful opponent of the Medici, it is now a residence of the King of Italy. It contains the highly renowned collection of pictures that bears its name, consisting of above 500 works, many of them by the most celebrated masters, and all in excellent preservation. Immediately behind the Palazzo Pitti are the Boboli gardens, about 1¼ mile in circumference. They were first planned in 1550 by Il Tribolo, under Cosmo I. They are laid out in long embowered walks and open glades, adorned with magnificent laurels, cypresses, yuccas, &c., and are enriched with terraces, statues, and vases, including four unfinished figures by Michael Angelo. The building formerly known as the *Bargello*, an imposing structure erected about 1250 for the chief magistrate of the republic, and subsequently used as a prison, has recently been restored, and is now opened as a national museum, illustrative of the history of Italian culture and art in medieval and modern times. The Laurentian or Medicean Library, a long and lofty gallery, with beautiful windows of stained glass, contains upwards of 9000 ancient MSS., equalled in importance by no collection except the Vatican. The Magliabecchian Library is the great repository of printed books, as the Laurentian is of manuscripts. It is in the same building as the Uffizi Gallery. There is a third library, called the Biblioteca Marucelliana, composed of a large and excellent collection of books bequeathed to the public by Abbot Francesco Marucelli, who died in 1703. The Biblioteca Riccardiana is a fourth public library. It was founded in the end of the sixteenth century by Riccardo Romolo Riccardi, and was purchased by the government in 1812. It contains 23,000 volumes and 3500 MSS., more especially belonging to the literature of the middle ages. As already mentioned, the private libraries of Florence are numerous and extensive. The charitable institutions are numerous and important, some of them manifesting, in a very remarkable manner, the wide and active benevolence of the Italian character. Several of these institutions are of very ancient date; one of them, called the Confraternità della Misericordia, has been in existence for 500 years. Schools, and other literary

and educational establishments, are also numerous. The most eminent of the literary societies is the Accademia Della Crusca, a society of Italian philologists, who compiled the great dictionary of the Italian language, and has also published very correct editions of several Italian classics. We may also mention the Accademia dei Georgofili (an agricultural society), the Società Promotrice della Belle Arti, which has annual exhibitions of painting and sculpture, and the Società Filarmonica. Among the scientific collections the museum of natural history is the richest, and possesses an admirable anatomical collection, chiefly of models in wax. There are also an observatory, a botanic garden, &c. The manufactures of Florence have greatly fallen off, but still silkworms are reared to a considerable extent; and woollens, silk, straw-hats, porcelain, mosaics, and pietra dura, are manufactured, and likewise numerous objects in the fine arts. The charms of a residence at Florence proceed not only from the sight of its present beauty, but also from the recollections of its past glory, the memorials of which surround you at every step. More powerful than the remembrance of its military glory, of its heroes in the middle ages, and the great council assembled here in 1478, is the reflection, that arts and sciences first revived here, and commenced the regeneration of Europe. The most celebrated names in Italian literature and art are of Florentine origin. Refinement, genius, and taste rendered the age of Lorenzo de' Medici one of the most brilliant in history, and took root so deeply as to be still conspicuous in the city where he ruled. The language of even the lower people is pure and graceful, and full of delicacy and expression. Generally speaking, the people are lively, polite, social, devout, and, like other Italians, fond of the theatre, but, in industry and dexterity, surpassing most of them.

Florence owes its origin to a colony of Roman soldiers sent thither by Octavianus after the victory of Perugia, to whom he allotted part of the territory of the colony of Fiesole, established about 40 years before by Sylla. Little more is known of it under the empire, and hardly any remains exist of that period, except some relics of an amphitheatre and a few inscriptions. Christianity was established here in the third century, and early in the fourth a Bishop of Florence attended a council at Rome. In the beginning of the twelfth century the city had risen into importance through the industry and enterprise of its inhabitants, who had now commercial establishments in the Levant, France, and other parts, and had become money-changers, money-lenders, jewellers, and goldsmiths. In the latter end of the fourteenth century the wealthy family of the Albizzi became chief rulers in Florence. These again were overthrown in 1434 by Cosmo de' Medici, a popular citizen and princely merchant, who assumed the first place in the state. On the fall of the republic in the sixteenth century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was placed by Charles V. as Duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterwards emperor of Germany. From this period the history of Florence merges into that of Tuscany, until its amalgamation with the Kingdom of Italy, From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin. It then received a considerable increase of population, and consequently a number of broad new streets have been constructed on the site of the old fortifications, and of late years its precincts have been extended in every direction, affording the best proof of its prosperity. Amongst the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, and others. Pop. (1872), 167,093.

FLORENTINE WORK, a kind of mosaic work, consisting of precious stones and pieces of white and coloured marble, for which the Florentines were distinguished, and which is still practised. It is applied to jewelry and various ornamental articles, including table-tops.

FLORES, or FLORIS.—1. *Endé* or *Mandfirei Floris*, a large island of the Indian Archipelago, forms one of the chain of islands which extend east from Java; length, above 200 miles; breadth, about 50 miles. It has a mountainous surface, with several volcanic peaks, one of which, Lobetobie, is 7200 feet high. Little is known of the interior. Sandal-wood, once abundant, has become scarce. Endé, near the middle of the south coast, is said to be the principal port, and to have safe anchorage for any number of ships. The passage between the east end of the island and those of Solor and Adenara is called Flores Strait; and the part of the Pacific north of the Flores chain and south of Celebes is called the Flores Sea.—2. The most western island of the Azores, about 30 miles long by 9 miles broad, with a hilly surface, containing an extinct crater now converted into a lake. The chief products are wheat, pulse, and poultry, and great numbers of small cattle are reared.—3. An island of the North Pacific, off the west coast of British America, opposite to Vancouver's Island; lat. 49° 20′ N.; lon. 125° 45′ W.; length, north-west to south-east, 15 miles; breadth, from 2 miles to 6 miles.

FLORIAN, JEAN PIERRE CLARIS DE, a graceful French writer, was born in 1755 at the castle of Florian, not far from Sauve, in the Lower Cevennes. His predilection for Spanish literature was derived from his mother, Gilette de Salgues, a native of Castile. The taste for the age of chivalry and its customs, which animates the romantic poetry of the Spaniards, is clearly to be recognized in his works. His earliest dramatic works were represented at a private theatre in the house of D'Argental, a friend of Voltaire, to one of whose nieces Florian was married. One of them, called Les deux Billets, is still a favourite. At the same time he distinguished himself by his poem called Voltaire et le Serf du Mont Jura, and the eclogue of Boaz and Ruth. His *éloge* of Louis XII. was less successful. In 1788 he became a member of the French Academy. After the death of the Duke of Penthièvre he retired to Sceaux, in consequence of the decree banishing all nobles from Paris. While there, engaged in finishing his poem Ephraim, he was arrested by the orders of the committee of public safety. The fall of Robespierre saved him from the guillotine, and gave one of his friends an opportunity to obtain his liberation; but his sufferings, and particularly the dreadful suspense which he had endured for a long time, had entirely exhausted him. He died soon after leaving the prison, at Sceaux, September 13th, 1794. As a poet Florian exercised his talents successfully in more than one department. Facility, grace, harmony, and a sensibility rare in the French character are the most striking characteristics of his works. In elevated subjects he is deficient in fire, strength, and colouring. His descriptions of manners are striking and faithful, particularly his pictures of pastoral life, as, for instance, in his favourite Estelle. As a writer of fables he ranks immediately after La Fontaine. Voltaire called him by the tender name of *Florianet*, which paints in a striking manner the species of

poetry to which the genius of Florian is adapted, and to which belong his Galatée (imitated from Cervantes), Fables, Contes en vers. His principal works are Estelle, Gonzalve de Cordoue, Numa Pompilius, and, among his dramatic works, the above-mentioned Deux Billets. His Don Quichote may be read as a French original, and is highly interesting, however little it may be esteemed by later translators.

FLORIDA, a peninsula and state in the United States of North America, having the states of Georgia and Alabama on the north; the Gulf of Mexico on the west; the Atlantic on the east; and the Gulf of Florida on the south; length, about 380 miles; average breadth, about 80 miles; area, 59,268 square miles. The surface is in general level, rising little above the sea, especially in the southern parts, where it is almost one continued swamp or marsh. The northern portion is more broken and elevated, but the whole coast is flat, and skirted by low, narrow islands of sand, which lie parallel to the mainland, and are separated from it by shallow unnavigable lagoons. The principal river is the Appalachicola; the next in importance are the Suwanee, St. John's, Ockloconee, &c.—the first two affluents of the Gulf of Mexico, the last two flowing to the Atlantic. The entrance to most of the rivers in this state has a bar that unfits them for the navigation of vessels drawing much water, but they are all navigable to a considerable extent by steamers and other vessels of light draught. There are a great many lakes throughout the peninsula, some of which are of extraordinary depth. The largest vary from 8 to 15 miles in length. Numerous islands are scattered along the whole coast, the most remarkable of which is a group called the Florida Keys or Cays, stretching out for more than 100 miles south and west of Cape Florida, and much dreaded by mariners. There are also several spacious bays, and many good harbours; they are mostly on the east coast, and include Chatham Bay, Charlotte Harbour, Killsbro' or Espiritu Santo or Tampa Bay, and Vascasana Bay on the peninsula, with the bays of Appalachee, St. Joseph, St. Andrew, Chactawhatchee or St. Rosa, Pensacola, &c., on the mainland. Although there is comparatively little cultivable soil in this country, what there is, especially that on the banks of the rivers, is of remarkable fertility, and, aided by a favourable climate, produces tropical plants and fruits in great perfection, especially oranges, which are not excelled by those of any other country; cotton, olives, pumpkins, and melons also succeed well. Tobacco also is grown in considerable quantities, sugar, maize, potatoes, oats, &c., being the other principal productions. The annual produce of tobacco is about 500,000 cwts. The leaf is good. The pine barrens produce grass, on which immense numbers of cattle are reared. On the river courses and richer swamps the trees and shrubs grow luxuriantly. The pine forests are of great extent, and the trees of extraordinary height and beauty. White cedar, cypress, and live-oak abound, the latter attaining great perfection. The cabbage-palm is also common. The climate from October to June is generally salubrious; but the months of July, August, and September are extremely hot, and during this season fevers are prevalent. The only minerals yet found are coal and iron, although it is said that amethysts, turquoises, *lapis lazuli*, and other precious stones have been met with. The wild animals consist of wolves, wild cats, panthers, racoons, opossums, and the common brown bear, which is sometimes seen in the swamps. Rabbits and squirrels also abound. Birds are extremely numerous and various, including vultures, hawks, turkeys, herons, cranes, cormorants, pelicans, &c. The coasts, rivers, and lakes swarm with fish, and tortoises also abound in the latter two. The swamps and other inland waters are infested with alligators, and inhabited by multitudes of frogs. Snakes are numerous, but most of them are harmless. Neither the trade nor manufactures of the country are important, the latter consisting chiefly of hats, caps, leather, bricks, carriages, and waggons. There are also several tanneries, a very little ship-building, and a number of grist and saw mills. The principal exports are cotton, sugar, oranges, and timber, chiefly live-oak, to the government navy-yards. The chief towns and seaports are Tallahassee, the capital, and seat of government; St. Augustine; and Pensacola, a naval station of the United States. Florida is divided into twenty counties. The governor is elected by the people for four years, and is ineligible for re-election until four years out of office; the senate, which consists of twenty-four members, is elected for two years, and the representatives, fifty-two in number, hold office for two years.

Florida was discovered in 1497 by Sebastian Cabot, sailing under the English flag; explored in 1512 and 1516 by Ponce de Leon, a Spanish adventurer; and in 1539 overrun with an armed force by Hernando de Soto, governor of Cuba. About the middle of the sixteenth century some French Protestants sought a refuge here from persecution, but their attempts to found a colony here were not fortunate. They were attacked by the Spaniards, and in the contests which ensued, after alternate successes, the latter were victorious. Florida was ceded to Great Britain by Spain in 1763 in exchange for Cuba; reconquered by the Spaniards in 1781; and confirmed to them at the peace of 1783. It was ceded to the United States in 1819, and in 1845 was admitted into the Union. In 1861 the greater part of the state seceded from the Union, but was reannexed after the subjugation of the Confederate States. Pop. in 1860, 140,425, of whom 61,745 were slaves; in 1870, 187,748, of whom 96,057 were white and 91,689 coloured.

FLORIDA BLANCA, Francisco Antonio Monino, Count of, Spanish minister in the reign of Charles III., was born in Murcia about 1730; died at Seville in 1809. He studied in the University of Salamanca, and soon rendered himself so conspicuous that he was intrusted with the important post of Spanish ambassador at Rome during the pontificate of Clement XIV. In that office he displayed great ability in several emergencies. He particularly distinguished himself by his activity in the abolition of the order of Jesuits, and in the election of Pius VI. Charles III., finding himself obliged to dismiss Grimaldi, the minister of foreign affairs, desired him to nominate his successor. Grimaldi recommended Monino, who at once acquired almost unlimited authority in Spain. He introduced post-coaches, and caused the post-roads to be made practicable; directed his attention to the most important subjects of general police, particularly in the capital; embellished Madrid, and was on every occasion the active friend of the arts and sciences. His attempt to secure the succession to the throne of Portugal to a Spanish prince proved abortive. His attack upon Algiers in 1777, and the siege of Gibraltar in 1782–83, were unsuccessful; but the result of his co-operation with the English colonies of North America in securing their independence was more favourable to Spain. A short time before the death of King Charles III. (December, 1788) he requested permission to retire, and presented to the king a justification of his ministerial career. The king expressed himself satisfied with the latter, but refused to accept his resignation. After the accession of Charles IV., however, his enemies, among whom was the Prince of Peace, succeeded, in 1792, in effecting his disgrace. He was

imprisoned in the citadel of Pampeluna, but was soon restored to liberty, and banished to his estates. He appeared once more upon the political theatre in 1808, when he was president of the extraordinary Cortes.

FLORIN is sometimes used for a coin, and sometimes for a money of account. The florin coin is of different values. The silver florins of Holland are worth about 1*s.* 8*d.* The British and Austrian florins are each worth 2*s.* The florin was first coined in England in 1849.

FLORIS, FRANS, a painter, whose family name was Vriendt, was born at Antwerp in 1520. He was called by his contemporaries the *Raphael of Flanders*. He studied the art of painting under Lombard, at Liége. The pupil soon surpassed his master. After his return to Antwerp Floris established a school for painters in that city. He afterwards went to Italy, where his taste, particularly in design, was improved by the study of the masterpieces of Michel Angelo; but he never equalled the grace and purity of form which distinguished the Florentine and Roman masters. His style was grand; but his colouring and his figures are reproached with dryness and stiffness. After his return to his native country he was engaged to execute important paintings, and soon acquired a considerable fortune, which he squandered by his excesses. He boasted of being the boldest drinker of his time, and, to sustain his reputation, drank on the most extravagant wagers. His intemperance brought him to an early grave. Most of his works, and in particular his triumphal arches, made on the occasion of the entry of Charles V. and Philip II. into Antwerp, and his Twelve Labours of Hercules, have often been engraved by skilful artists. His paintings are to be met with in Flanders, Holland, Spain, Paris, Vienna, and Dresden. He died at Antwerp in 1570.

FLORUS, ANNÆUS, a Roman historian, was probably a native of Spain or Gaul. He is variously styled in the MSS.; in some *L. Annæus Florus*, in others *L. Julius Florus*, in others *L. Annæus Seneca*, and in one simply *L. Annæus*. He lived in the beginning of the second century after Christ, and wrote an abridgment (epitome) of Roman history in four books, from the foundation of the city to the first time of closing the Temple of Janus, in the reign of Augustus. His style is florid, and not sufficiently simple for history. Some are of opinion that the work of Florus belongs to the age of Augustus, but that it has come down to us with interpolations in facts and language. The best edition is that of Duker (Leyden, 1744); later ones are by Titze (1819) and Seebode (1821).

FLOTSAM, JETSAM, AND LIGAN, in law. *Flotsam*, or *floatsam*, is when a ship is sunk or cast away, and the goods float on the sea. The goods belong to the crown, unless claimed by the owner within a year and a day. *Jetsam* is when a ship is in danger of being sunk, and in order to lighten the ship, and thereby attempt to bring her off, the goods are thrown overboard. *Ligan* is when the goods so cast into the sea are so heavy that they sink to the bottom, and therefore the mariners fasten to them a buoy or cork, or such other thing as will not sink, to enable them to find them again.

FLOUNDER, the vulgar name of different species of the genus *Platessa*, a member of the family Pleuronectidæ, or flat-fishes, but most usually applied to the *Platessa flesus*. It is especially found in the northern seas, in the Atlantic, the German Ocean, and the Baltic, and being one of the few flat-fishes which are found in fresh water it abounds in the rivers of England, Holland, Germany, and the north-west of France. Its length seldom exceeds 1 foot, and its greatest breadth is usually about one-third of its length. Its colour varies, according to the situation in which it is found, from dark to light brown, and it is always marked with spots of a darker colour. The fins are uniformly of a lighter colour than the body, but the spots are darker. The blind side of the fish has small black spots on a light yellow ground. This fish is known in Scotland by the name of *fluke*.

FLOUR, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. See MILL.

FLOUR, ST., a town in France, in the department of Cantal, 33 miles east by north of Aurillac. It consists of the town proper, occupying a plateau with precipitous sides, and of a suburb communicating with it by a winding road cut in the rock. It contains an ancient cathedral, a Jacobite convent, a Jesuits' college, &c. The manufactures consist of leather, glue, copperware, lace, and pottery; and the trade is in grain and mules. Pop. 5218.

FLOURENS, MARIE JEAN PIERRE, a distinguished French physician and physiologist, born at Maureilhan, in the department of Hérault, April 15, 1794; died at Montgeron, near Paris, December 6, 1867. When scarcely nineteen years old he took the degree of Doctor of Medicine at Montpellier, and shortly after proceeded to Paris, where he connected himself with the great leaders of science at that time, including Chaptal, Georges and Frédéric Cuvier, Destutt de Tracy, Geoffroy Saint-Hilaire, and others, the first three of whom became his intimate friends. His first scientific writings, which were distinguished by their perspicuous style and analytical precision, appeared in 1819. In 1821 he delivered a course of lectures at the Athenæum on the physiological theory of sensation, and during the same period contributed to the Academy of Sciences a number of papers on subjects connected with the physiological structure of man and the lower animals, which excited a great amount of interest in scientific circles. He was also a contributor to the Revue encyclopédique, and to the Dictionnaire classique de l'Histoire naturelle of D'Orbigny. In 1828 he was elected a member of the Academy of Sciences, in 1830 was appointed by G. Cuvier to fulfil the duties connected with the chair of comparative anatomy at the Jardin des Plantes, and, after discharging these duties two years, was himself nominated to the professorship. In 1833 he succeeded Dulong as permanent secretary to the Academy of Sciences. In 1840 he was admitted a member of the French Academy. In 1837 he had been elected to the chamber of deputies by the arrondissement of Béziers. He took his seat upon the left, but did not mix himself up with party politics. In 1845 he received the rank of commander in the Legion of Honour, having been an officer in the legion since 1837, and was at last, August 11, 1859, raised to the rank of grand-officer. In 1846 he was created by Louis Philippe a peer of France, but he was deprived of this dignity by the revolution of 1848. Flourens combined with profound scientific knowledge great literary talent. His works are very numerous, but the following may be mentioned particularly:—Recherches expérimentales sur les Propriétés et les Fonctions du Système nerveux (Paris, 1824); Expériences sur le Système nerveux (1825); Developpement des Os (1842); Anatomie de la Peau (1843); Mémoires d'Anatomie et de Physiologie comparées (1844); Buffon (1844); De l'Instinct et de l'Intelligence des Animaux (1841); De la Longévité (1854); De la Vie et de l'Intelligence (1858); Œuvres de Buffon (1853-55); Des Manuscrits de Buffon (1859); Éloges historiques (1857). Flou-

rens was the first to demonstrate experimentally that the substance of the animal body undergoes a constant process of renewal.

FLOWER, its nature and use. The flower is that part of a plant which is destined to produce the seed. Its organs are of two kinds, namely, the floral envelopes, consisting of the protecting parts or leaves of the flower, and the essential organs. In a complete flower the floral envelopes are double, composed of two whorls or circles of leaves, alternating with each other; the outer series consisting commonly of green or greenish leaves named sepals, and together forming the calyx; and the inner series, of leaf-like parts, usually of a delicate texture, and of some other colour than green, named petals, and together constituting the corolla. The term perianth is sometimes applied to the floral envelopes taken together, but it is generally restricted to those flowers in which only one of the series is present, at least in appearance, as in the lily, with its six petaloid sepals, and in the common marsh-marigold and anemone; or in other instances where the limits of the calyx and the corolla are not easily distinguished. The essential organs of reproduction are the stamens or fertilizing organs; and the pistils, which receive the fertilizing influence and produce the seeds. The stamens and pistils form other two whorls or circles inside of the corolla and calyx, the whole four series being considered as leaves altered to suit the particular functions performed by each circle, and all of them alternating with each other on the principle of alternation which regulates the succession of the true leaves upon the stem. When flowers become double, the stamens and pistils are more or less converted into petals; and a still more remarkable illustration of the leaf-character of the pistil occurs in the double-flowering cherry, in which that organ reverts to the form and colour of the true leaf. The end of the flower-stalk, or the short axis upon which the successive circles of sepals, petals, stamens, and pistils are placed, is named the receptacle or thalamus, which is greatly modified in different plants—the strawberry, for example, being a succulent receptacle, upon the surface of which are scattered the small fruits or achenes, resembling seeds; and the fig being another form of succulent receptacle, in the hollow of which are contained the stamens and pistils. The numbers which commonly prevail in the parts of the flower are 2, 3, and 5, or their multiples. Thus, a flower with 5 sepals in the calyx has usually, alternating with them, 5 petals in the corolla; the number of stamens is 5, 10, or 20; and 5, or a multiple of that number, constitutes the parts of the pistil. Flowers are said to be perfect when they are provided with both kinds of essential organs, namely, stamens and pistils; complete, when they have all the kinds of organs which any flower possesses, namely, calyx and corolla, stamens and pistils; regular, when all the parts of each set are alike in shape and size; and symmetrical, when they have an equal number of parts of each kind, or in each whorl of organs, as in the case stated above. Flowers are called unsymmetrical when the different series of organs do not agree in the number of their parts, of which a familiar illustration occurs in the larkspur. The law of symmetry is frequently interfered with by adhesion, abortion, or non-development of the parts of a flower. Flowers are termed irregular when the different members of the same kind, as, for example, the petals or the stamens, are unlike in size and form, of which the monkshood and the violet furnish examples. Sometimes the corolla is absent, and the flower, having only one envelope, is called monochlamydeous. In other instances both calyx and corolla are awanting. Sometimes the stamens are in one flower and the pistils in another on the same plant, which is then named monœcious; or, in the same species, the stamens are produced by one plant and the pistils by another, when the plant is termed diœcious. Such are the arrangements prevailing in the extensive division of plants called Flowering, or Phanerogamous. In ferns, mosses, lichens, fungi, seaweeds, &c., the reproductive organs are obscure, and the plants of this division are styled Flowerless, or Cryptogamous.

FLOWER-CLOCK is a contrivance for measuring time by means of flowers.—Flowers, it is well known, open and shut according to the state of the atmosphere, or according to the length of the day. Some, however, open at certain hours of the day, as, for instance, early in the morning or in the evening, and thus afford the means of indicating the time. If, for instance, flowers are chosen which regularly open one hour and then shut again, and others that open and shut the next hour are placed beside the former, and so on until sunset, we have a timepiece of flowers, such as was constructed by Linnæus.

FLOWER-DE-LIS. See FLEUR-DE-LIS.

FLOWERS, in chemistry, a term formerly applied to a variety of substances procured by sublimation in the form of slightly cohering powder; hence in all old books we find mention made of the flowers of antimony, arsenic, zinc, and bismuth, which are the sublimed oxides of these metals in a more or less pure state. We have also still in use, though not generally, the terms *flowers* of sulphur, of benzoin, &c.

FLOWERS, ARTIFICIAL. These are not a modern invention. Among the ancients the floral wreaths made by the Egyptians enjoyed as great a reputation as, at the present day, do the products of Parisian art. The Romans, also, excelled in the art of imitating flowers in wax, and in this branch of the art attained a degree of perfection which has not been approached in modern times. The Egyptian artificial flowers were made of thin plates of horn stained in different colours, sometimes also of leaves of copper gilt or silvered over. Crassus, renowned for his wealth, gave to the victors in the games he celebrated at Rome crowns of artificial leaves made of gold and silver. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by English and French manufacturers, but more especially by the latter. The perfection which this art has now reached is truly marvellous. From the opening bud to the fully expanded flowers all parts of a plant can now be imitated with the most admirable fidelity.

The first artificial flowers made in modern times in civilized countries were manufactured out of diversly coloured ribbons, which were twisted together and attached to small pieces of wire. But these first attempts, although they bore more or less resemblance to what they were intended to represent, were only rude copies. In course of time feathers were substituted for ribbons, a material much more elegant than that previously in use, but one to which it was not so easy to give the requisite shades of colour. The plumage of the birds of South America is admirably adapted for being used by the manufacturer of artificial flowers, on account of the brilliancy and permanence of their tints; and the natives of that quarter of the globe have long practised with success the art of making flowers with feathers. The fine down which is obtained under the wings of young pigeons is specially esteemed for this branch of the industry. The Zoological Gardens in Regent's Park, London, contain a magnificent collection of artificial flowers made out of the feathers of humming-birds. In Italy the cocoons of silkworms are frequently used for the purpose, as these take on a brilliant

colour and have a velvety appearance. Among the other materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, blown glass, mother of pearl, brass, &c., besides the various vegetable and mineral colouring matters. For the richer and more gaudy kinds of plants, precious stones, such as diamonds, rubies, topazes, sapphires, emeralds, &c., are used, and in South America the natives are very fond of wearing artificial flowers entirely composed of the wings, wing-cases, corselets, and other parts of some brilliant specimens of coleopterous insects (such as the Buprestidæ) inhabiting those regions. In former times, in the height of the fashionable rage for porcelain, flowers of all kinds were made of that substance, and the odour of the real flowers was imitated by means of perfumes.

FLOWERS, COLOURS OF. The colours of flowers have been arranged in two series, the blue and the yellow, in both of which red is found, green being produced by a mixture of the two. The tints are due to fluid or viscous matters contained in superficial cells, and can be separated in certain cases by solution in water, and in others by solution in alcohol and ether. Attempts have been made to refer the colouring matters to one or two principles, which have been described under the names of xanthin, xanthein, anthoxanthin, and cyanin and anthocyan. These bodies, however, are very ill-defined, and are, in all probability, mixtures, even supposing that when obtained from different sources they are essentially the same. The chief difficulty is to obtain the colouring matters in sufficient quantity for investigation, and then to separate them accurately from each other, which, as they are amorphous uncrystallizable bodies, is not easy to accomplish satisfactorily. Of the colouring matters from flowers, one of the most individualized is the yellow body got from saffron. See CROCIN and SAFFRON.

FLOWERS, LANGUAGE OF. In the youthful and imaginative period of nations, flowers, as well as colours and other objects of sense, often have particular symbolical significations attached to them. Who does not know that the rose is the flower of Venus, the flower of love? Who does not remember the sad passage of Shakspeare, where rosemary, the flower of widows and of mourning for the departed, is so happily introduced? In Asia, where the imagination is livelier and less checked by intellectual cultivation than in Europe, and where the art of writing is not generally practised, the language of flowers has acquired a more distinct character. The signification of flowers has become more distinctly fixed, and the art of combining them, so as to express not only a single idea but connected thoughts, has grown up. The seclusion of women in the East, and their ignorance of writing, connected with their lively imagination, which personifies every object, must be considered as the chief causes of the invention of this language. Whoever has seen a lively Italian girl make an appointment with her lover, by describing a circle with her finger to represent the sun, and then making the sign of two, or any other number, to indicate a particular hour after sunset or before sunrise, according as the figure is made on one or the other side of the circle, will not be surprised that the ladies of the East can carry on a correspondence by means of flowers. It is true they can only convey general notions, such as 'thy grief pains me,' &c.; but their life is so unvaried that they have little else to convey. The bouquet which is used as a letter is called *selam*. The language of flowers is, of course, arbitrary, and a bouquet which a Persian girl would understand would be unintelligible to an Egyptian inmate of the harem. The charm of novelty has sometimes attracted attention in the West to this tender language, and dictionaries have been composed to explain its mysteries. But the European races are too much matter-of-fact people to find pleasure in the habitual use of these emblems, which are, moreover, incapable of expressing the complicated ideas springing up in active and intellectual society. In the oriental language of flowers the same plant, under different circumstances, receives different senses; for instance, a rose without thorns means *we may hope everything;* whilst a rose without leaves means *there is no hope.* In the works on this subject, published principally in Germany and France, there is less delicacy of shading in the expression. The Germans have a very old proverb *Durch die Blume sprechen* (to speak through flowers), which means to speak indirectly and darkly. The English phrase to *speak under the rose* means, to speak under condition of secrecy.

FLOWERS OF ANTIMONY. See ANTIMONY.

FLOWERS OF SULPHUR. See SULPHUR.

FLOWING, the position of the sheets or lower corners of the principal sails when they are loosened to the wind, so as to receive it more nearly perpendicular than when they are close-hauled, although more obliquely than when going before the wind. A ship is, therefore, said to have a flowing sheet when the wind crosses the line of her course nearly at right angles; that is to say, a ship steering due north, with the wind at the east, or directly on her side, will have a flowing sheet; whereas, if the sheets were extended close aft, she would sail two points nearer the wind, viz. N.N.E.

FLOW OF LIQUIDS. See HYDROKINETICS and HYDRAULICS.

FLUELLITE, a rare mineral found in small truncated rhombic octahedrons in Cornwall. It is white, vitreous, and transparent, and is said to be a fluoride of aluminium.

FLUENT, in fluxions, the flowing quantity, or that which is continually increasing or decreasing, whether line, surface, solid, &c. See CALCULUS.

FLUID. A perfect fluid is defined to be a body which is incapable of resisting change of shape. Commonly the name is applied to a body in the liquid or gaseous condition; in either of which states its parts possess great mobility among themselves. A perfect fluid is an unrealizable conception. All the fluids that we possess—both liquid, however mobile, and gases—do offer finite resistance to changes of shape, if those changes are made rapidly. It is found, however, that they do not offer any *permanent* resistance to change of shape: and this is the case even with bodies that are commonly called *semifluids*, if the change is made slowly enough. Such a body as treacle, for example, if poured into a vessel and left to itself for a sufficiently long time, takes the shape of the vessel perfectly, and finally comes to rest with its surface perfectly level, or at least so nearly level that no test that we can apply indicates any deviation whatever from perfect levelness. It may thus be said that, as far as the statics of fluids is concerned, the fluids that we meet with in nature may be considered as perfect: the *motion* of ordinary fluids, on the other hand, differs widely, in many cases, from the motion of the imaginary perfect fluid. *Viscosity of fluids* is the name given to the internal molecular friction which causes finite resistance in a moving fluid. For information on various questions relating to fluids, see LIQUID, GAS, VAPOUR, HYDROSTATICS, HYDROKINETICS, VISCOSITY, &c.

FLUIDS, ELECTRIC. See ELECTRICITY—Theories of.

FLUOCERINE AND FLUOCERITE are two minerals found at Finbo, in Sweden. The former is a compound of ceric fluoride, and oxide, has a yellow

colour and resinous lustre, and occurs massive. The latter is ceric fluoride, and is found crystallized in hexagonal prisms of a dark red or yellow colour.

FLUOR, FLUOR-SPAR, or DERBYSHIRE SPAR. The crystals of this mineral all belong to the monometric system, the cube and octahedron occurring commonly, and a number of intermediate forms being also known. The crystals vary in size; sometimes they are very minute, at others they are several inches in diameter, and cubical crystals a foot through have been met with. Besides occurring in crystals, it forms also columnar and fine grained masses. The fracture is conchoidal and splintery; lustre, vitreous; colour, white, though not very common, and seldom pure; more generally wine-yellow or violet-blue. Among its brightest colours are emerald and pistachio-green, sky-blue, rose-red, and crimson-red. Very dark blue colours, bordering on black, and probably due to foreign admixtures, sometimes occur. Sometimes different shades of colour are disposed in coats parallel to the faces of the cube, or symmetrically distributed along the edges or solid angles of crystals. Translucent as well as transparent; brittle; hardness, between apatite and arragonite, and capable of being scratched with ease by the knife; specific gravity, 3·14. Fluor is composed of 51·3 of calcium and 48·7 of fluorine, and its formula is CaF_2. Specimens of fluor-spar, however, sometimes contain small quantities of chlorine, sulphate of barium, phosphate of calcium, and fluid matter. Before the blowpipe it decrepitates and becomes phosphorescent, but loses its colour, and melts at last into an opaque globule. It phosphoresces likewise if thrown upon ignited charcoal or heated iron. The light emitted is generally purple, though some varieties afford bright green colours, and, in consequence, have received the name of *chlorophane* or *pyromaraydus*. A variety of this latter kind, from Ecaterineburg, in Russia, phosphoresces simply from the warmth of the hand. If fluor be exposed to too high a temperature it loses the property of again showing this phenomenon. Sulphuric acid decomposes the powder of the mineral; hydro-fluoric acid is disengaged in a gaseous state, and corrodes glass. Several varieties, particularly the sky-blue and rose-coloured ones, lose their colour on exposure to the light. Fluor is not unfrequently found in beds, as at Alston Moor and Castleton, in England; more generally, however, it occurs in veins in argillaceous schist and secondary limestone, accompanied by galena, blende, calcareous and pearl spars, heavy spar, quartz, bitumen and clay, as at several places in Cumberland and Durham, of the same country. It is also found in primitive rocks accompanying tin ore, mica, apatite and quartz, as at Zinnwald, in Bohemia. The most remarkable deposit of fluor in America, hitherto discovered, is along the country south-west from Cave Rock, on the Ohio, for 30 miles, in Gallatin county, Illinois, where it exists in an alluvial situation, or in veins traversing a compact limestone. Its crystals are often large, and various in their colours: the prevailing tint, however, is a dark purple, approaching black, which is owing to the interfusion of bituminous matter, as is apparent from the odour when the crystals are broken. The chlorophane variety exists very plentifully at New Stratford, Connecticut, where it is accompanied by topaz and magnetic pyrites. The uses of fluor are numerous and important. It is employed as a flux in the reduction of various ores, from which circumstance the name *fluor* has been derived. When employed in metallurgy it not only assists the fusibility of the refractory mineral matter, but it has also been employed for the removal of silica and titanic acid. Fluor-spar is the source of all the hydrofluoric acid used in the arts for etching upon glass, and this property of the mineral was known two hundred years ago. The acid evolved by the action of sulphuric acid was afterwards repeatedly examined, but the first investigation of importance was that by Scheele, in 1771. He, however, got the acid contaminated with fluoride of silicon, and it was not till some time after that pure hydrofluoric acid was produced. (See FLUORINE.) Formerly the finest specimens of fluor-spar were cut and worn as gems; but their inferiority in point of hardness has brought them into disuse. It still continues, however, when obtained in masses of sufficient dimensions, to be wrought into ornamental objects such as vases, basins, obelisks, &c. This manufacture is confined to Derbyshire, no other part of the world affording fluor sufficiently firm and tenacious for the purpose, and at the same time possessed of such fine colours. The work is performed on a lathe turned by water, the foot-lathe being much more liable to produce fractures in the piece worked, by its want of steadiness. The tool employed at first is a piece of the best steel; after which a coarse stone is applied with water, so long as the smoothness is improved by these means; then the finer gritstone, pumice, &c.; till, finally, the article becomes sufficiently smooth to receive emery, with which the operation is completed. The crevices which frequently occur in the masses of fluor are sometimes concealed by the introduction of galena; and as this substance is often naturally found with the fluor, it becomes difficult to detect the fraud. In selling the articles, also, it is a frequent practice to moisten them with water, under the pretence of removing dust, which is done to bring out the colours otherwise invisible, and which, of course, disappear as soon as the objects become thoroughly dry.

FLUORESCENCE, the name given by Stokes to the appearance presented when rays of high refrangibility are allowed to fall on acid solution of sulphate of quinine and on some other bodies. The term *epipolic dispersion* was given to the same phenomenon by Herschel, and *internal dispersion* by Brewster. Sulphate of quinine, when dissolved in water with the help of a little sulphuric acid, gives a solution clear and colourless by transmitted light; but on looking down into the liquid while it is held in a beam of sunlight, or on looking at it from various positions, the whole mass of the liquid appears suffused with a beautiful bluish cloud, which makes the liquid seem self-luminous. A solution of the bark of the horse-chestnut tree, and many other bodies, possess the same property; and it may often be seen in the common paraffin oil used for burning. Stokes showed that, a tube containing solution of sulphate of quinine being carried along the prismatic spectrum from the red end, 'throughout nearly the whole of the visible spectrum the light passed through the tube as it would have done through so much water, but on arriving nearly at the violet extremity a ghost-like gleam of pale blue light shot right across the tube. On continuing to move the tube the blue light first increased in intensity, and afterwards died away. It did not, however, cease to appear until the tube had been moved far beyond the violet extremity of the spectrum visible on a screen.' When a beam of sunlight is allowed to enter a darkened room by a small hole, and is received on a prism in such a way as to spread the visible spectrum over a length of several feet on a screen at the other end of the room, a very striking appearance is presented if the tube is placed in the *dark part* of the spectrum, a foot or more beyond the last point where light is distinguishable. Instantly a beautiful blue light is seen in a place where there was absolutely no light before. On examining the light

that comes from the tube when it is in the violet end of the spectrum with the help of the spectroscope, it is found to contain rays extending over a considerable range of refrangibility within the visible spectrum. It appears, thus, that light of high refrangibility falling on a fluorescent body has its refrangibility altered; and there seems to be good reason for supposing that the light is first absorbed by the body, and then given off again in its altered condition.

FLUORINE, a very widely distributed element, which is known only in combination, for it is doubtful if the element has ever been isolated. Its most abundant compound is calcic fluoride, which not only exists in the mineral kingdom as fluor-spar (which see), but forms an essential part of the bones and teeth of animals. Fluorine has also been detected in the blood, milk, and urine; in plants; in volcanic sublimates; in rocks; in coprolites and mineral phosphates; and in a variety of minerals, such as cryolite, fluellite and fluocerite, yttorcerite, apatite, amblygonite, wagnerite, wavellite, ralstonite (a mineral quite recently found in cryolite from Arksut Fiord, and containing apparently fluorine, aluminium, sodium, and calcium), &c. &c. Many attempts to isolate fluorine have been made, but none can be said to have absolutely succeeded. The difficulty lies in the great chemical activity of the element, for as soon as it is liberated from one substance it seems to combine with another, and attacks the material of which the apparatus is constructed. To avoid this difficulty vessels of gold and platinum, and of fluor-spar itself have been used, and the compounds which have been employed are fluoride of silver and fluoride of potassium. In the latter case electricity was the agent, and in the former both chlorine and iodine have been tried. On all occasions decomposition took place, and a gas was evolved which was colourless, but had a pungent odour. According to one experimenter the gas did not attack glass, could be collected over mercury, and was absorbed by potash; but others found that the gas acted both upon glass and metals. The descriptions are so discordant that it may be concluded that either fluorine has not been obtained at all or that it is allotropic, or that some of the decomposition products are not the pure element. The combining weight now usually assigned to fluorine is 19. From the nature of some of its compounds it has been proposed to double this number, but the reasons are not sufficient, in the face of certain important experimental data, and if it were adopted it would, besides, destroy the analogy at present believed to exist between its compounds and those of the halogens, as compared with the oxygen and sulphur group of elements. Fluorine is always detected by conversion into hydrofluoric acid, and the subsequent action of this acid upon glass.

Hydrofluoric Acid (HF) was first obtained and studied by Scheele in 1771. As got by him it was contaminated by silicic fluoride, but other observers showed the source of the silica and the pure acid was ultimately analyzed by Gay-Lussac and Thénard, but its analogy to hydrochloric acid was pointed out by Ampère and Davy. The acid is prepared by decomposing a metallic fluoride with an acid, fluor-spar and sulphuric acid being employed in practice. The decomposition is effected in a retort of lead or platinum, and the acid which distils over is collected in a leaden, platinum, or gutta-percha bottle. The acid must not be allowed to come in contact with glass, porcelain, or other material containing silica, otherwise silicic fluoride is formed. Prepared in this way it always contains water. When dry hydrofluoric is wanted it is got by heating bifluoride of potassium (KFHF) in a platinum retort carefully luted, and connected with a platinum bottle or receiver. On heating to redness the acid comes off and condenses in the bottle to a colourless, transparent, mobile liquid, of specific gravity 0·98. It is excessively volatile, and escapes from a bottle containing it with considerable violence, at a little above the ordinary temperature boils, evolving a colourless gas, which fumes in the air, and is extremely deliquescent. The dry gaseous acid does not act on glass, but the liquid acid is powerfully corrosive. Both act upon the skin with virulence, and great care is necessary in dealing with them. Many experiments have been made with the dry acid as to its action on a great variety of substances, the result being that when a change takes place at all it is of a violent kind, but that in other cases there is little or no effect. Thus the metals, except potassium and sodium, do not decompose it, nor do the non-metallic elements, whereas different classes of salts act most powerfully. Organic matter is attacked at once; it dissolves in alcohol, but explodes with turpentine. As above said, it has an intense affinity for water, quite as great as that of sulphuric acid; and the solution differs in some properties from the absolute acid. It is still very destructive to animal and vegetable tissues, and its vapour is irrespirable, and even mixed with the air is dangerous to inhale; and it also reacts more in the usual manner with metals and metallic compounds, forming fluorides. It is most remarkable in this state for its tendency to react with silica to form silicic fluoride—a transparent, colourless gas, decomposed by water. Advantage is taken of this, its chief property, both in chemistry and the arts. Hydrofluoric acid is used in chemistry to decompose and dissolve silicates and other refractory minerals which are not acted on by the ordinary acids, when it is desired to avoid fusion by alkalies or alkaline carbonates. The mineral reduced to an impalpable powder is either digested in a platinum dish with successive portions of the acid, or the dish containing the powdered mineral moistened with water is placed on a stand in a larger leaden dish containing powdered fluor-spar and sulphuric acid, which is then closed completely with a leaden lid, and set in a warm place till the decomposition may be deemed complete. In the arts hydrofluoric acid is used, especially for etching upon glass. The glass is covered with wax, the desired pattern is cut through the wax down to the glass, and the plate is then either treated with an aqueous solution of the acid, or of a fluoride and sulphuric acid, or is exposed to the gas itself. After a sufficient length of time the excess of acid is removed, and the wax being dissolved away the pattern which has been etched becomes visible. This use of fluor-spar is said to have been known in the seventeenth century to a German artist, Schwanhardt by name, and it is the reaction by which fluorine is invariably detected.

The fluorides are a large but not a very important class of salts. They are not so soluble in water as the chlorides, but, on the other hand, fluoride of silver is readily soluble. The salts are prepared either by double decomposition or by dissolving a metallic compound or the metal itself in the acid. Some metals, such as copper, not affected by hydrochloric acid, are readily attacked by hydrofluoric acid, and this is particularly the case with the rarer elements tantalum, zirconium, &c. Fluorine, indeed, of which no compound with oxygen, nitrogen, chlorine (?), bromine, iodine, carbon (?), and perhaps other elements, is known, seems to make up for this want of affinity by an excess of attraction to all the rarer elements. With these it forms fluorides or oxyfluorides, and these compounds form with the alkaline fluorides double salts, of which the boro-, silico-,

stanno-, titano-, zirco-, tantalo-, and niobio-fluorides, and the molybdo-, tungsto-, and niobio-oxyfluorides are examples. These compounds are not without analogies among the chlorides, the platinochloride of potassium, for example, closely resembling the silico-fluoride in constitution. Many of these double salts are isomorphous; but there are exceptions.

FLUSHING (Dutch, *Vlissingen;* French, *Flessingue*), a seaport town in Holland, in the province of Zeeland, on the island of Walcheren, at the mouth of the Hond, or West Schelde, here between 2 and 3 miles broad, 50 miles S.W. Rotterdam, 38 miles W.N.W. Antwerp. It is strongly fortified, and in connection with its outwork at Breksen, on the opposite side of the Schelde, completely commands the river, with which it communicates by two large, deep canals, by which the largest merchantmen enter the town and unload at quays close to the warehouses. The town-house is a roomy, suitable edifice; the exchange is a simple building, and near it is a statue, erected in 1841, of Admiral van Ruyter, born in Flushing in 1607. The inhabitants are chiefly engaged in commerce, and in the branches of industry incident to a seaport town. There is a large building-yard where men-of-war of the largest size can be built. The manufactures, comprehending brewing, soap-making, and fulling and oil mills, are unimportant. After the capture of Briel by the Confederates, in 1572, Flushing was the first town in Holland to raise the standard of freedom. From 1585 to 1616 Flushing was in the possession of the English, as security for part of a loan granted by the English government to the Dutch. Flushing has suffered several times from fire, water, and war, and in 1809 was bombarded by a British fleet, under Lord Chatham, composing the unfortunate Walcheren expedition. The beautiful town-house, built in 1594, several churches, and other important buildings, were then destroyed. Pop. 11,521.

FLUTE, a portable musical instrument blown with the breath, and consisting of a tube furnished with a number of holes in it for the purpose of varying its sounds. The oldest form of the English flute was called *flûte à bec*, on account of the resemblance of its mouth-piece to the bill of a bird. In form it was similar to the pipe; it had seven holes which could be stopped by the fingers, but it had no finger-keys. This was in use till about the beginning of the eighteenth century, when it gave place to the German flute, an instrument which, in its best form, was 27 inches in length, consisted of four pieces fitting into one another, and had from six to twelve finger-keys for the semitones, with a compass of nearly three octaves. This form of the flute, though a great advance on the *flûte à bec*, was, nevertheless, owing to certain defects, absolutely incapable of performing certain runs. The improvements made on this instrument by Theobald Böhm, a German, acting in conjunction with Gordon, an Englishman, went far to remove these defects so as to enable a performer to execute on the flute any passage, however chromatic. The chief improvement consisted in the application of a system of keys, by which several holes could be stopped at one time, by one movement of the finger. The flutes made by Böhm are now taken as the models, by most makers in all countries. In modern flutes the number of keys varies. The materials of which flutes are made are box, ivory, ebony, silver, glass, and *bois de grenadille*, a kind of red ebony. The last is said to be the best.

FLUTING, in architecture, channels or furrows cut perpendicularly in the shafts of columns. It seems probable that this kind of ornament had some relation to the original type; perhaps the furrowed trunk might have suggested the idea. It is, however, a beautiful ornament, which is applied with equal happiness to break the otherwise heavy mass of a Doric shaft, or to obviate an inconsistent plainness in the other orders. When the lower parts of the flutes of a column are filled with a convex bead, they are said to be cabled.

FLUX, a substance or mixture added to assist the fusion of minerals. In the large way, limestone and fluor-spar are used as fluxes. In the smelting of iron great attention has to be paid to the fluxes, because on their character depends to some extent the complete separation of the metal. To accomplish this the flux must be such that it will combine with the earthy matter of the ore, and form a slag, which must neither be too refractory nor fusible. Hence if the ore abound in clay or sulphur, lime or limestone, and possibly sand must be added; if in quartz, lime and clay are requisite, otherwise the quartz is slagged by combining with part of the iron, which is thus lost. Frequently ores are so selected that the earthy matters present may flux each other, but this requires skill and experience. The fluxes made use of in assays or philosophical experiments consist usually of alkalies and alkaline salts, as borax, microcosmic salt, cyanide of potassium, common salt, which render the earthy mixtures fusible by converting them into glass. Alkaline fluxes are either the crude flux, the white flux, or the black flux. Crude flux is a mixture of nitre and tartar, which is put into the crucible with the mineral intended to be fused. The detonation of the nitre with the inflammable matter of the tartar is of service in some operations, though generally it is attended with inconvenience, on account of the swelling of the materials, which may throw them out of the vessel. A modification of this is called Baumé's flux. It consists of three parts of saltpetre, one of sulphur, and one of saw-dust, and when this deflagrates sufficient heat is liberated to fuse a piece of silver. Morveau's flux consists of 40 grains powdered glass free from lead, 5 grains of calcined borax, and 2½ grains of powdered charcoal. This acts both as a flux and as a reducing agent. White flux is formed by projecting equal parts of a mixture of nitre and tartar, by moderate portions at a time, into an ignited crucible. In the detonation which ensues the potassic tartrate is oxidized by the nitre into carbonate, which is the main constituent of the residue. Black flux differs from the preceding in the proportion of its ingredients. In this the tartar is in excess of the nitre, so that the combustion is incomplete, but the excess of tartar is decomposed, carbonaceous matter separates, and the mass thus acquires its black colour. It therefore acts both as a flux and as a reducing agent, and is used in the smelting of metallic ores on the small scale. Black flux is also prepared by simply charring bitartrate of potassium; the salt is converted into carbonate, and is obtained intimately mixed with the carbon, derived from the excess of tartaric acid. Soda flux is sodic carbonate, prepared by heating sodic acetate in a close vessel. The fluxes used in pottery are very various, and are distinguished by different names; but they almost all consist of litharge or red-lead, with sand or boracic acid, sometimes singly, sometimes together. They are therefore essentially colourless glasses used as vehicles for infusible colours.

FLUXIONS. See CALCULUS.

FLY, a term popularly used for most dipterous insects, but more especially given to the very troublesome members of the genus *Musca*. During the summer and autumn much inconvenience is suffered from flies, which settle upon every light-coloured object. The

common house-fly is an absolute cosmopolite, as there has been no part of the world yet visited where it was unknown, and in some countries it exists in such quantities as to create a serious evil. It preys upon every description of animal and vegetable matter, always preferring such as is in a state of putrefaction. Flies are useful as agents in the removal of nuisances, which they effect gradually by their numbers. The flesh-fly deposits its eggs upon animal matter in a state of incipient putrefaction. The *larvæ* or maggots, upon being hatched, devour the substance in which they are placed, and assume the *pupa* state about the time their nourishment is exhausted. Flesh-flies (*Sarcophaga*) are gifted with an extraordinary sense of smell, by which they are enabled to discover the offensive objects upon which they delight to feed at great distances. By this they are frequently attracted to flowers which have a disagreeable smell. The small flies, which are so annoying to horses and cattle during the summer months, were also arranged by Linnæus in his great genus *Musca*, but now form a genus (*Stomoxys*), which differs from the true flies in having the mouth furnished with a peculiar proboscis, which, when at rest, is carried bent horizontally, but which, when about to sting, the insect places perpendicularly, and pierces the skin, immediately producing a very sharp and disagreeable sensation. The *tzetze*, so destructive to cattle in Africa, belongs to a nearly allied genus, *Glossina*. In the genus *Tabanus* the large black horse-fly is arranged, and into this genus also several other species of flies are referable. Flies are observed to be very active previous to rain, and during its continuance enter houses in great numbers, proving a source of great trouble and annoyance to the inmates in soiling books, paper, furniture, &c. A variety of methods have been recommended for their dispersion, few of which, however, are of much avail. A mixture of molasses and water in a covered vessel, having a small opening cut in the top, is perhaps the best. A solution of corrosive sublimate is also effectual, but its poisonous quality makes it too dangerous to be carelessly exposed.

FLY-CATCHER. The birds which constitute this class have given rise to great difficulties as to their scientific arrangement, not two authors agreeing in their ideas on the subject. They form the genus *Muscicapa* of Brisson and Linnæus, with the exception of some of the larger species, known by the name of *tyrants*, which the latter placed in his genus *Lanius*. In this he was followed by Gmelin and Latham, who augmented the genus by adding many species. Lacepède divided them into three genera, according to the size of the birds, calling the largest *Tyranni*, the next *Muscivoræ*, and the smallest *Muscicapæ*. Cuvier, in his last edition, forms three subgenera, under the names of *Tyrannus*, *Muscipeta*, and *Muscicapa*, though he also admits several genera and subgenera as appertaining to this class. Temminck divides this great genus into two, *Muscipeta*, nearly resembling Cuvier's subgenus of the same name, and *Muscicapa*. Lastly, Sclater restricts the Muscicapidæ to a family of which the spotted fly-catcher (*Muscicapa atricapilla*) is the type for one division, while to the other belong the blue fly-catcher (*Myiagra azurea*), the fantail (*Rhipidura*), and the paradise fly-catcher (*Tchitrea paradisi*), the *Muscipeta* of Cuvier. These birds are widely distributed over the globe, abounding where insects are most numerous, and are of infinite use in destroying those numerous swarms of noxious insects, engendered by heat and moisture, which are continually on the wing. These, though weak and contemptible when individually considered, are formidable by their numbers, devouring the whole produce of vegetation, and inducing the accumulated ills of pestilence and famine. The habits of these birds are taciturn, solitary, and untamable. They perch on the highest branches of trees, whence they watch for insects, and take them on the wing with great quickness.

FLYING. The power of locomotion through the air is possessed by various animals in different degrees. Birds, bats, and insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree-frogs, and flying-fish can move through the air in one direction for a short time. The wing of a bird or insect is an elastic flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forwards and downwards, and the bird quickly ascends. In continuous flight the body may be inclined, or, as is usual, horizontal: the direction of flight depends on the slope of the wings. If the bird flies level the wing strikes downwards and slightly forwards; if it wishes to rise, the stroke is more decidedly forwards; if to sink, downwards and backward. Pettigrew has shown, and Marey has adopted his view, that the wing describes a figure of 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and towards the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained. Weight is necessary for flight, and in consequence it is found that the area of the wing diminishes as the weight of the bird increases; thus the gnat has eleven times the wing surface of the swallow, reducing both to the same weight. It is difficult to explain the sailing of the albatross for long stretches without apparent motion of the wings. Probably the original impetus is maintained by the kite-like slope of the wing, and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance. The air cavities in the body and bones of birds may contribute but are not essential to flight; the bat does not possess them; but, as in insects, the function of the extended air surface may be to aerate the blood more rapidly, and thus maintain the prolonged muscular efforts needed. If the extinct Pterodactyles are excepted, all animals other than birds, bats, and insects, which move through the air, as squirrels, flying-dragons, &c., do so as parachutes, going from higher to lower levels, but never rising, nor flying horizontally. The similarity of the movements in flying, swimming, and walking will be discussed under LOCOMOTION (ANIMAL), which see.

FLYING-BRIDGE, a kind of ferry in which the force of the current of a river is applied to propel the boat from the one side to the other. The following is the method by which this is accomplished:—A chain is attached at one end to a buoy fixed in the middle of the river, and at the other to a part of the boat in the line of the keel, and rather nearer the prow than the stern. By means of the helm the prow of the boat is made to point obliquely up the stream, in the direction of the opposite bank, and in such a manner that the keel of the boat forms an obtuse angle with the chain connecting the boat with the buoy. In that position the force of the current, resolved in a direction at right angles to the course

of the river, is sufficient to propel the boat to the opposite side, in the line of an arc of a circle having the buoy for its centre and the chain for its radius. This kind of ferry is often found to be very useful for occasional purposes, as on military expeditions, &c.

FLYING-DRAGON, or FLYING-LIZARD. See DRAGON.

FLYING-FISH (*Exocetus*), a fish which is enabled, by the vibration of its large pectoral fins, to leave the water when alarmed or pursued, and sustain itself for several seconds in the air. In tropical seas the flying-fish rise from the water in flocks, or, more properly, shoals, of many thousands at a time, when disturbed by the passing of a ship, or pursued by their inveterate foes, the dolphin and albicore. They spring from the crest of a wave, and, darting forward, plunge into another to wet the membrane of the fins, and in this manner continue their flights for several hundred yards, often pursued by marine birds in the element to which they are driven for protection against the tyrants of their own. In all the species belonging to the genus *Exocetus*, which is referred to the Scomberesocidæ or garfishes, the pectoral fins are very much developed, and the superior lobe of the caudal fin shorter; the head and body are invested with large soft scales, and the body has a ridge or *carina* extending longitudinally along each flank, which gives it somewhat of an angular appearance. Head, when viewed from the front, triangular; eyes very large; teeth minute, sometimes absent; branchiostegous rays ten; air-bladder very large. Flying-fish are inhabitants of every temperate sea, though abounding in the vicinity of the equator. In length they rarely exceed 13 inches, and are commonly found about 8. The flesh is pleasant, and much resembles that of the fresh-water gudgeon. Several species are described by naturalists, some of which have very long fleshy filaments depending from the lower jaw, the use of which is not known. The *Exocetus volitans*, or common flying-fish of the Atlantic, bears some resemblance to the *E. exiliens*, which is found in the Mediterranean, but differs in having small ventral fins inserted behind the centre of the body. The rapidity and force with which these fish move through the air by the aid of their pectoral fins are such, that, in coming on board ships, they are generally killed by the violence with which they strike, and in some cases the head is fractured and beaten to pieces. Several species have appendages or filaments attached to the lower jaw, as we have observed above; but it is noteworthy that these occur only in small individuals, and the appendages are therefore perhaps only possessed by the young of species which are destitute of barbels. Among these is the *Exocetus appendiculatus*, a very rare species, few specimens of which exist in collections.

FLYING-LEMUR, or FLYING-FOX. See LEMUR.

FLYING-SQUIRREL. See SQUIRREL.

FLY-TRAP. See DIONÆA MUSCIPULA.

FLY-WHEEL, a heavy disc or hoop balanced on its axis of motion and at right angles to it, attached to machines to regulate their motions. The use of the fly-wheel may be illustrated by the case of the ordinary beam-engine, in which one end of the beam is attached to the piston-rod, and the other end to a rod connecting it with a crank fixed to the axle of a fly-wheel. As the beam oscillates vertically on its centre it is clear that when the piston-rod is at its highest the crank must be at its lowest, and in a line with the rod connecting it with the one end of the beam. In these circumstances any force applied to push the piston downwards would be resisted longitudinally by the connecting-rod, and no motion would ensue; but the momentum of the fly-wheel, resulting from the motion previously communicated to it, carries the crank beyond this position, and allows the piston again to be pushed down. The effect of the fly-wheel is thus to equalize the motion of the whole engine.

FO, the Chinese name of Buddha. See BUDDHA.

FOCHABERS, a village in Scotland, in the county of Moray, on a height above the right bank of the Spey, 8 miles south-east of Elgin. At the east end of the village is a fine building devoted to educational purposes, built and partly supported by funds bequeathed by Alexander Mylne, a native of the place, who made a large fortune as a merchant in New Orleans. The total sum bequeathed for the purpose amounted to £20,000. The splendid mansion of Gordon Castle is in the vicinity. Pop. 1227.

FOCUS, in optics, is a point wherein several rays concur or are collected after having undergone either refraction or reflection. This point is thus denominated, because the rays being here brought together and united, their joint effect is sufficient to burn bodies exposed to their action; and hence this point is called the *focus* or burning-point. It must be observed, however, that the focus is not, strictly speaking, a point, for the rays are not accurately collected into one and the same place or point, owing to the different nature and refrangibility of the rays of light, to the imperfections in the figure of the lens and other similar impediments. The focus, therefore, is a small circle, which Huyghens has demonstrated to be one-eighth the thickness of the lens when it is convex on both sides; that is, it cannot be less than this, but in imperfect glasses it exceeds the above measure sometimes considerably.

FŒTUS, in anatomy, a term applied to the offspring of the human subject, or of other mammals, during its residence in the womb. See EMBRYO.

FOG. There is a constant ascent of watery particles from the surface of the earth, occasioned by the evaporation from masses of water and moist bodies. Part of the water which rises in vapour is intimately united with the atmospheric air, which holds it in solution. This portion of aqueous matter is invisible, and exists in the greatest quantity in very warm and serene weather. Thus, in the hot days of summer, any cold body (as a vessel filled with iced water) is immediately covered with little globules of water, which are the vapour of the atmosphere precipitated. But when the air is saturated the watery particles which continue to rise are no longer dissolved, but remain suspended in vesicular vapours, which form clouds (which see) when they rise to a great height, and fogs when they hover near the surface of the earth. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day; as, for instance, in autumn, when, in the warmest part of the day, the air is capable of holding a great quantity of aqueous matter in solution, which on cooling, towards evening, it is no longer capable of dissolving. In hot weather the air is not so easily saturated, and in cold weather the process of evaporation is very slow, so that in these cases fogs are less common. In low, moist places, and in confined places, as valleys, forests, bays, or lakes, surrounded by high lands, they are much more prevalent than in open countries or elevated spots, where they are quickly dispersed by the winds. There is another atmospherical phenomenon, which has been called *dry fogs*. In 1783 all Europe was enveloped with a dry fog, at the moment of a simultaneous volcanic action in Iceland and Calabria. In 1755, before the earthquake which destroyed Lisbon, a similar fog overspread the Tyrol and Switzerland. It appeared to be composed of extremely fine earthy particles.

FOG-BANK, an appearance in hazy weather, which frequently resembles land at a distance, but which vanishes as you approach it.

FOGGIA, or CAPITANATA, a province of Southern Italy on the Adriatic, between the provinces of Campobasso and Bari. It possesses rich pastures. Among its special products are wines, saffron, and fruits. The principal town is Foggia. Area, 2954 square miles. Pop. in 1871, 319,164.

FOGGIA, a walled town of Italy, province of Foggia or Capitanata, Naples, in the centre of the Apulian Plain, 79 miles N.E. of Naples. It consists of regular and spacious streets, often lined with handsome mansions, in which the provincial nobility reside. Its principal edifices are a Gothic cathedral, several other churches and convents, a governor's palace, a custom-house, a theatre, a grammar and other schools. The trade is chiefly in corn, for which immense granaries have been formed under the streets, and in wool, cattle, wine, and capers. The annual fair is very important. Pop. in 1872, 38,138.

FOG-SIGNALS, signals given by means of sound to warn vessels of the neighbourhood of danger during fogs, when lights or other visible signals cannot be perceived. Various kinds of fog-signals are used, among which may be mentioned bells, drums, gongs, guns, compressed air-whistles, steam-whistles, and fog trumpets or horns. The distance at which any of these can be heard varies, of course, according to the force and direction of the wind. Gongs are not very powerful as signals, often failing to be heard at more than the distance of a quarter of a mile. Bells may be heard during fogs at a distance of from 1 to 3 miles. Guns have been heard as far as 10 miles, with a light breeze blowing across the sound. A compressed air-whistle near Newport, Rhode Island, U.S., has been heard clearly during thick fogs at 6 or 8 miles' distance. Steam-whistles have about the same range. Fog-horns seem to be superior to whistles. They sound by means of compressed air, which impinges on a metallic tongue or reed, the sound being afterwards concentrated and directed by means of a trumpet-shaped mouth-piece. Fog-signals are also used on railways during foggy weather to enable the engine-drivers to know where they are, and where to look for their usual signals. They consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it comes up to them.

FOIL, a thin leaf of metal, placed under transparent substances, such as precious stones, for the sake of improving their colour and heightening their lustre, the light, which passes through the transparent body, being reflected by the metal. Figuratively, anything that serves to set off another object, by improving its external appearance. Foil is also used to signify the sheet of amalgam laid on the side of a mirror, which enables it to reflect a complete image. Foil, in fencing, a blunt sword, or one tipped with a button or cork, covered with leather.

FOIX (Latin, *Fuxium*), a town of France, capital of the department Ariège, beautifully situated across the mouth of a valley, between lofty precipices, at the junction of the Arget with the Ariège, here crossed by a bridge. It is partly inclosed by ancient ramparts, and has a very antiquated appearance, consisting of narrow ill-formed streets and very indifferent houses. The most interesting objects are the old castle, crowning an isolated rock; a handsome parish church; the abbey of St. Volusien, occupied partly by the prefecture; the courthouse, also an ancient structure; the communal college, and barracks. The chief manufactures are articles in iron and steel; and the trade is in these, and in cattle, wool, leather, pitch, turpentine, &c. Foix distinguished itself in maintaining the cause of the Albigenses against their infamous persecutor Simon de Montfort. Pop. 6746.

FOIX, GASTON DE. See GASTON.

FOJANO, a town of Italy, province of Arezzo, Tuscany, 15 miles S.W. of Arezzo, near the centre of the Val di Chiama. It is an old but handsome town, inclosed both by a modern wall and the remains of a double wall and chain of towers, which in early times added greatly to its strength: and has an elegant parish church, a Benedictine convent, a large hospital, and a trade in corn and cattle. Pop. 7039.

FOKIEN, a province of China, bounded N. by Che-kiang, N.W. and W. by Kiang-see, S. by Quantong, and S.E. and E. by the China Sea; area, 71,062 square miles. The coast is deeply indented by bays and studded with islands, including Amoy, Quemoy, and Hai-tan. The island of Formosa is also included in the province. The interior is generally mountainous; but by cultivating not only the plains and slopes, but terracing the hill sides, often to their summits, the far greater part of the surface is turned to good account. The higher mountains are covered with trees, and the cultivated terraces sometimes number thirty to forty. The Min and its tributaries are the most important rivers. The principal products are rice, wheat, barley, tea of superior quality, silk, sugar, indigo, camphor, and tobacco. The minerals include iron and alum, which, with porcelain, various tissues, and the above products, are the chief exports. The capital is Foo-choo-foo. Amoy and other important commercial towns are also included in the province. Pop. 22,699,460.

FOKSCHANI, a town of Rumania, in Walachia, on the frontiers of Moldavia, right bank of the Miklov, 92 miles N.E. Bucharest, with an upper district school. In 1789 it was devastated by the Russians, and, after being rebuilt, it was in 1822 burned by the Turks, since which time it has been again partially restored. Pop. 1000. On the left bank of the Miklov, in Moldavia, is a suburb of Fokschani. Pop. 6000.

FOLC-LAND, one of two principal modes of tenure of land among the Anglo-Saxons, the other being boc-land (book-land), or land held by a charter or deed. Folc-land was the property of the people, and while it continued to be held by this tenure it could not be alienated. It was sometimes, however, parcelled out for a term to individuals, on the expiration of which it reverted to the community. It was subject to greater burdens and more numerous exactions than boc-land. Its proprietors were liable to the charges of public works, hospitality, and other common duties of the district, from which boc-land was free. Folc-land might be held by freemen of any rank, but was not devisable by will, unless it was converted into boc-land, which could be done by the sovereign. Folc-land seems to have been assigned as a reward for military services.

FÖLDVAR (*Duna*), a town of the Austro-Hungarian Empire, Hungary, county Tolna, pleasantly situated, partly on the summit and partly on the side of a hill above the right bank of the Danube, 17 miles E.N.E. of Simontornya. Only some remains of its once strong fortifications now exist. It has a Roman Catholic and a Greek Non-united church, a Franciscan monastery, high school, barracks, and a valuable sturgeon fishery. Pop. 12,382.

FOLIATED EARTH, or TERRA FOLIATA TARTARI. Acetate of potassium is said to have been known as early as the thirteenth century, but the mode of preparing it from carbonate of potassium by affusions of acetic acid and repeated crystallizations from alcohol is fully described by Philip Müller in the seventeenth century. It is now prepared by nearly neutralizing acetic acid with carbo-

nate of potassium, evaporating, and fusing at a gentle temperature. The mass is broken up and transferred to a bottle with a good stopper. Acetate of potassium is a white foliated solid with a pungent taste and soapy to the touch—in fact it is a true soap. It is very deliquescent, and dissolves also in alcohol. It is used to a considerable extent in medicine. *Terra Foliata Mineralis* was the name given to acetate of sodium, which is a much more recently discovered substance. It is prepared by acting on carbonate of sodium with acetic acid and crystallizing. It is not deliquescent, but is quite soluble in water, though rather sparingly in alcohol. It is not much used in medicine.

FOLIGNO [anc. *Fulginium*], a town of Italy, in the province of Perugia, 20 miles S.E. of Perugia, in a beautiful vale winding among the Apennines, 40 miles in length by about 10 in width, watered by the Clitumnus. The only public buildings worthy of notice are the cathedral and the Palazzo Communale. Manufactures, woollens, parchment, wax candles, soap, and playing cards; there are also silk-mills and tanneries, and it has some trade in cattle. It was anciently a place of some importance, being at the head of a confederacy of Umbrian cities. In 1439 it was incorporated with the States of the Church by Cardinal Vitelleschi, on the extinction of the Friaci family. Pop. 7891.

FOLKESTONE, a seaport, England, county Kent, 7 miles W. by S. of Dover, and 82 miles by rail S.E. of London, partly on the shore and partly on a steep cliff immediately behind it. It has suffered much from encroachments of the sea, which is said to have swept away four out of its five churches. The remaining one, crowning the summit of the height, and surmounted by a tower rising from its centre, is the most conspicuous edifice. The original number of churches has since been restored. There is a battery on the height and three Martello towers. Folkestone was first a Roman station; and under the Saxons rose to some importance, having both a monastery and a castle. It suffered from the ravages of the Danes, and at a later period from incursions of the French. Its prosperity, which had greatly declined, has been revived by its having been made a terminus of the South-east Railway, and a chief station for steamers to Boulogne. It is now a favourite watering-place. Folkestone is included in the parliamentary borough of Hythe. Pop. in 1871, 12,698.

FOLK-LORE, a useful term of recent introduction into the English language, and, from the great variety of matters to which it is applied, somewhat difficult of definition. It includes all popular superstitions and superstitious observances whatever they relate to, as to births, marriage, diseases, death, burial; all popular sayings and beliefs relating to the weather, the influence of the moon, &c., beliefs which are sometimes founded on observation, but which are fully as frequently unfounded and erroneous: all traditional mythology and beliefs in supernatural beings and agencies; ceremonies observed at popular festivals, as Hallowe'en or May-day; ancient songs and ballads, popular rhymes, nursery tales, &c. Folk-lore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies. It is, therefore, of great assistance to the ethnologist, the sociologist, and the historian, as well as to the student of comparative mythology and of the science of religion. It has attracted much attention in recent times, and in Germany has been studied with scientific method by the brothers Grimm, Felix Liebrecht, and others. Among English books on the subject we may mention Sir Thomas Browne's Pseudodoxia Epidemica (1646), Aubrey's Miscellanies (1696), Brand's Popular Antiquities, by Sir Henry Ellis; Hone's Every-day Book, Year Book, and Table Book; Chambers' Book of Days; Notes and Queries, &c.

FOMENTATION, in medicine, is the external application of a fluid, as warm as the patient can bear it. Two flannel cloths are dipped in the liquor, one of which is wrung as dry as possible, and immediately applied to the part affected. This cloth lies on till the heat has evaporated, and the other is then applied. By this alternate application the part affected is constantly supplied with warmth for fifteen minutes or half an hour, as occasion may require.

FONBLANQUE, ALBANY WILLIAM, English journalist, was born in 1797. He was educated for the bar, but developing a taste for political discussion, he was first engaged in the Morning Chronicle, and afterwards in the Examiner, of which he became the proprietor, editor, and leading writer. A reprint of many of his articles, under the title, England under Seven Administrations, appeared in 1837. In reward of his advocacy of liberal principles Lord John Russell appointed him chief of the statistical department of the Board of Trade in 1852. He still continued to be an occasional contributor to the Examiner, but from this period his active connection with journalism may be said to have ceased. He died 14th October, 1872.

FONDI, the ancient *Fundi*, a town of Italy, Naples, in the province Terra di Lavoro, near a lake to which it gives name; 40 miles W. Capua, on the Appian Way, which here is still in good condition. It is a bishop's see, and contains a cathedral. At the extremity of the town is an old castle, of no great strength. Fondi stands in a plain, surrounded on one side with hills, whence it looks like an amphitheatre. Most of these hills are covered with olive-trees, and the whole plain is interspersed with orange, lemon, and other fruit-trees, whose verdure forms a perpetual spring. The Lake of Fondi (anciently *Lacus Fundanus*, or *Amyclanus*) lies between the road and the sea; it sends forth noxious exhalations. Pop. 4937.

FONT, in church architecture, the vessel which contains the water for baptism. It is frequently sculptured in stone or marble, with richly decorative designs. The form of font with which we are now familiar seems to have been introduced in mediæval churches. In the early Latin Church, from the time of Constantine, baptism was administered in baptisteries, which were buildings separate from but adjoining the church. (See BAPTISTERY.) When baptism by sprinkling had superseded baptism by immersion, separate baptisteries gradually fell into desuetude, and the baptismal font assumed its modern form.

FONTAINE, JEAN DE LA. See LA FONTAINE (JEAN DE).

FONTAINEBLEAU, a town of France, in the department of Seine-et-Marne, and in the midst of the forest of same name, about 2 miles from the left bank of the Seine, and 37 miles S.S.E. Paris. It is well built, partly of stone and partly of brick, with spacious and regular streets; is the seat of a court of first resort, and several public offices; contains fine barracks, a communal college, school of design, public library of 28,000 volumes, public baths, and several hospitals; and has manufactures of calico, porcelain, and stoneware; quarries of sandstone, extensively used in paving the streets of Paris and the roads of the surrounding districts; and a trade in wine, fruit, preserves, horses, and cattle. Pop. 12,870. The castle or palace of Fontainebleau, from which the town derives its chief importance, is one of the most magnificent in France. Many of its sovereigns have made it their favourite residence,

and vied with each other in lavishing upon it all the embellishments that art could furnish, without any limitation as to expense. Henri IV. expended upon it about £100,000; Louis XIV. above £200,000; Napoleon I. £250,000; and Louis Philippe, it is said, still more than any of his predecessors. The park, laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls, corresponds to the magnificence of the palace. The forest, which has an area of 85 square miles, abounds with all kinds of game. Fontainebleau was a royal residence in the twelfth century. The château was begun by Francis I., and he received the Emperor Charles V. in it in 1539. It was the residence of Ex-queen Christina of Sweden in 1654, and Napoleon I. signed his abdication here 4th April, 1814.

FONTANA, Domenico, an Italian architect of the sixteenth century, born at Mili, a village on the Lake of Como, in 1543. He pursued the study of geometry in his youth, and at the age of twenty went to Rome, where he studied the remains of ancient and the master-pieces of modern art. Cardinal Montalto (afterwards Pope Sixtus V.) engaged him in his service as an architect, and employed him to construct a chapel in the church of St. Maria-Maggiore, and a palace in the garden of the same church. Montalto, like other Italian prelates and princes, was ambitious of attaching his name to some imposing works, and directed Fontana to spare no expense. But the pecuniary resources of the cardinal failed, and the undertaking would have been interrupted had not Fontana himself supplied the means for continuing the work. Montalto was not unmindful of this liberality; being soon after raised to the Papal chair, he confirmed Fontana in his office of architect, and employed him in building another palace near the baths of Diocletian. Sixtus V. wished to remove the great obelisk, now in front of St. Peter's church, which was then nearly buried under the rubbish, to the middle of the square. This undertaking had been already contemplated by several popes, but had been relinquished on account of the difficulty of accomplishing it. Fontana happily executed this gigantic operation in the year 1586. He afterwards erected three other obelisks, which were found, partly buried under ruins, in different squares. Among other buildings erected by Fontana, by the command of Sixtus V., and which are an honour to the patron not less than to the architect, the library of the Vatican, and the aqueduct (*acqua felice*), deserve particular mention. Under Clement VIII. Fontana also constructed several buildings, and repaired ancient monuments. Having been accused of converting to his private use the money received for public purposes, he was deprived of his office by the pope, but immediately received the offer of the post of architect and chief engineer of the King of the Two Sicilies, and, in 1592, went to Naples. He there constructed several canals to prevent inundations, a new road along the bay, and the royal palace in the capital, which, however, has been since considerably changed. His plan for a harbour at Naples was executed after his death by another architect. Fontana died at Naples in 1607, and was succeeded in the office of royal architect by his son Julius Cæsar. We have but one literary work by Domenico Fontana (Rome, 1590, with nineteen engravings). It is an explanation of his method of removing the great obelisk. The process must be considered as his own invention, since the writings of former architects contain no rules on this subject.

FONTANA, Felice, natural philosopher at the grand-ducal court of Florence, was born at Pomarolo, not far from Roveredo, in the Italian Tyrol, in 1730; began his studies in the schools at Roveredo and Verona, and, after having completed them at the universities of Padua and Bologna, went to Rome, and thence to Florence. The Grand-duke Francis (afterwards emperor) appointed him professor of natural philosophy in the University of Pisa. The Grand-duke Leopold (afterwards Emperor Leopold II.) invited him to Florence, but permitted him to retain his office at Pisa, and employed him in forming the cabinet of the natural sciences, which is yet one of the ornaments of Florence. This collection contains an immense number of anatomical preparations in coloured wax, which exhibit all parts of the human body in the minutest detail, and in all imaginable positions. They are executed with the greatest skill, and were made by different artists under the direction of Fontana. The Emperor Joseph II. procured from him a similar collection for the surgical academy in Vienna. In the same way many plants, and other natural objects, which lose their natural colours by keeping, were represented in coloured wax from nature, under his direction. Fontana is the author of several works on scientific subjects, some of which have been translated into German and French. He also made several discoveries relative to the application of carbonic acid, and different sorts of gas. His writings show him to have been an ingenious and indefatigable observer. The political principles which he avowed during the events of 1799 in Tuscany involved him in some difficulties. He died in 1805, and was buried in the church of Santa Croce by the side of Galileo and Viviani.

FONTARABIA. See Fuenterrabia.

FONTENAY-SOUS-FOURONNES, a village of France, department of the Yonne, where a bloody battle was fought between the sons of Louis le Débonnaire in 841, the consequence of which was the division (843) of the Frankish Empire, founded by Charlemagne. Lothaire I. received Italy, and what was afterwards called *Lorraine*, with the title of *emperor;* Louis received Germany, and Charles the Bald France. There are many other places of this name in France, some of which are distinguished from each other by some particular epithet.

FONTENELLE, Bernard le Bovier de, born at Rouen, 1657; son of an advocate and of a sister of the great Corneille. Although he lived to the age of nearly 100 years, and retained, till his death in 1757, a remarkable degree of activity, preserving a sound mind in a sound body, he came into the world so weak that it was not thought possible that he could survive. He began his youthful studies in the college of the Jesuits at Rouen, and at the age of thirteen entered the class of rhetoric. After completing his studies he was admitted an advocate, conducted a cause, which he lost, and renounced the bar for ever. In 1674 he went to Paris, and soon became known by his poetical effusions and learned works. Several of his poems appeared in the Mercure galant, and displayed much poetic sensibility and taste. Before the age of twenty he had assisted in the composition of the operas of Psyche and Bellerophon, which appeared under the name of his uncle, Thomas Corneille. In 1681 he brought out his tragedy Aspar, which was unsuccessful. Its failure excited so much attention that Racine wrote an epigram on it. Zeal for the fame of his uncle, and personal feeling, brought him into a party entirely opposed to the opinions of those who then directed the destinies of French literature. But his amiable character and his love of peace prevented him from entering into the contest with acrimony. In the dispute concerning the comparative merit of the ancients and moderns he favoured the opponents of antiquity. He became acquainted in his youth with the philosophy of Des-

cartes, and remained attached to it without being willing to defend it. In 1683 appeared his Dialogues of the Dead, which were favourably received, although his continual straining after wit and novelty deprives them of the charm of natural ease. His Entretiens sur la Pluralité des Mondes (1686) was the first book in which astronomical subjects were discussed with taste and wit. It has now become obsolete, in consequence of the advancement of science. Fontenelle distinguished himself as secretary of the Academy of Science by his Éloges—a class of writings which have become so common since his time.

FONTENOY, a village in the Netherlands, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French, under Marshal Saxe, defeated the British, Austrian, and Dutch allied forces.

FONTEVRAULT, a commune of France, in the department of Maine-et-Loire, with 3581 inhabitants, situated in the middle of a forest occupying a valley in which flows a perennial fountain, 10 miles south-east of Saumur. This valley is celebrated as the site of the rich Benedictine abbey founded by Robert d'Arbrissel in 1099. This abbey, containing both monks and nuns, was always, after the death of Robert, governed by an abbess. The title of the Abbess of Fontevrault was 'Abbesse, chef et general.' She was abbess of the Benedictine nuns, and chief and general of the Benedictine monks. According to Jal this form of government dates from the twelfth century. Robert founded three monasteries under the same roof—one, Le Grand Moutier, for widows and virgins; another, Le Saint Lazare, for lepers; a third, La Magdelaine, for fallen women. The men occupied a special locality. They cultivated the land and provided for the wants of the community, while the women prayed and sang praises to God. The order was under the rule of St. Benedict. The superiority of the female sex was adopted in honour of the mother of Christ. This abbey became the head of an order, and had many dependencies. There were thirty in Brittany alone, and the number of nuns belonging to the order was estimated in 1145 at 5000. It had declined to 700 in 1248, and to 500 in 1360. The order was reformed in 1475 by the twenty-sixth abbess, Marie of Bretagne, and the severity of her rule was maintained by Anne of Orleans, sister of Louis XII., Renée of Bourbon, and Jeane-Baptiste of Bourbon, daughter of Henry IV. The last abbess, in 1789, was Madame d'Antin, niece of Madame de Montespan. The abbesses of Fontevrault always belonged to the highest families. In the abbey of Fontevrault are the tombs of Henry II. and of Richard I., kings of England and counts of Anjou, and of Eleanor, wife of Henry II., and Elizabeth, wife of John, king of England.

FOO-CHOO, a town, China, capital of the province of Fokien, in a plain surrounded by an amphitheatre of hills, on the left bank of the Min, 125 miles N.E. of Amoy. It consists of the town proper, surrounded by walls, and of extensive suburbs, which, stretching along both sides of the river, communicate by a stone bridge. The walls, 30 feet high and 12 feet wide at top, are overgrown with grass, and the gates, seven in number, are overlooked by high towers. The streets are extremely dirty, and the lines of shops, crowded with goods or with workmen in the act of making them, make the whole place look like one vast series of market-stalls. The principal edifices are the Ching-hwang Miau, and several other temples. Foo-Choo is one of the five ports thrown open by the Treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbour is difficult. Principal exports—timber, bamboo, fruits, tobacco, potash, oil-cakes, and orange-peel. Principal imports—salt fish, bones, cotton, sugar, and sugar-candy. To these should be added opium, which, though not mentioned in the list from being contraband, is one of the most important of all, as about one-half of the population of 600,000 are understood to be addicted to it, and annually consume to the value of £450,000. See CHINA—Trade and Commerce.

FOOD. See ALIMENT and DIETETICS.

FOOL. See JESTER.

FOOLS, FEAST OF. Festivals, under this name, were regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies, and form one of the strangest phenomena in the history of mankind. Among the heathen festivals which the Christians could not easily abolish, were the Saturnalia, which, in the confusion of all distinctions of ranks, and in extravagance of merriment, exceeded the gayest carnivals. The feast of fools, among Christians, was an imitation of the Saturnalia, and, like this, was celebrated in December. The chief celebration fell upon the day of the Innocents, or upon New-year's Day; but the feast continued from Christmas to the last Sunday of Epiphany. At first only the boys of the choir and young sacristans played the principal part in them; but afterwards all the inferior servants of the church, and even laymen, engaged in them, whilst the bishop, or the highest clergyman of the place, with the canons, formed the audience. The young people, who played the chief parts, chose from among their own number a *bishop* or *archbishop of fools*, or *of unreason*, as he was called, and consecrated him, with many ridiculous ceremonies, in the chief church of the place. This officer then took the usual seat of the bishop, and caused high mass to be said, unless he preferred to read it himself, and to give his blessing to the people, which was done with the most ridiculous ceremonies. During this time the rest of the performers, dressed in different kinds of masks and disguises, engaged in indecent songs and dances, and practised all possible follies in the church. Except from their association with the Saturnalia nothing is known of the origin of these extravagancies, which appear to have been very ancient. The most celebrated, and probably one of the most ancient of these festivals, was held in the city of Sens, in France. By an ordinance in 1245, intended to abolish it, it is alluded to as a very ancient celebration. So general was the custom of these celebrations in France, that it is said there were few towns at the end of the seventeenth, or even as late as the middle of the eighteenth century, in which associations did not exist with the titles of *Cours des Fous* or *Cours des Sots*. Similar antics seem to have been played in other countries, as Germany, England, and Scotland, but it is to be hoped that the height of profanity reached in some of the extant liturgies and rubrics was not commonly attained in these fooleries. The *fête des fous* at Sens was suppressed in 1547. A minute history of it has been written by Aimé Chérest. These fêtes were frequently prohibited, but until the Reformation period, when they were considered dangerous by the ecclesiastical authorities, they were commonly tolerated. Sir Walter Scott says that the general title of the leader of the fantastic ceremonies was in Scotland the Abbot of Unreason, and in England the Lord of Misrule. In France the fête des fous was frequently called the *fête des innocents*, or *fête de l'âne*. There were other celebrations by the same associations at other periods of the year. To account for these celebrations, so opposed to all our ideas of religion, decency, and common sense, we must transfer ourselves to

times when men combined, with childish simplicity, the most ridiculous with the noblest subjects, and often with less injury than we should suppose to the latter. When we gaze on the slender and elegant columns of a Gothic church, we often find, in the tracery of the capitals, a squirrel, a monkey, or even a miniature man in a ridiculous attitude, as some quibble or stroke of humour is often interspersed in the dramas of Shakspeare, in the midst of the most tragic scenes. Burlesque or indecent figures were even not unfrequently drawn in the work of the large initial letters of the prayers in the breviaries of this period, with a license which would be most startling to an observer whose ideas were formed entirely on the usage of later periods.

FOOT, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches.—*Square foot* is a square whose side is one foot, and is therefore equal to 144 square inches.—*Cubic foot* is a cube whose side is 1 foot, and the cube contains 1728 cubic inches. The foot is a common measure in various countries, but its dimensions vary. The Paris foot is 12·789 inches English; the Rhenish foot 12·356. The French *pied usuel* is the third part of a mètre, equal to 13 inches 1 line.

FOOT, in prosody, a measure consisting of a variety of syllables, two, three, or four, in combinations of long and short, or accented and unaccented. The number of possible varieties of feet is reckoned at twenty-eight, but some are mere duplicates, and others of little practical use. See RHYTHM.

FOOT, HUMAN. The foot of man, specially designed for the support of the body, is not an organ of prehension, and cannot, like the foot of the monkey, take hold of objects by opposing the thumb to the other fingers; the toes, disposed upon the same plane, have neither the length of the fingers nor the extent and variety of their movements; in a word, it is a foot, and not, as in the quadrumana, a hand. The foot is composed of twenty-six bones, seven of which constitute the tarsus, which articulates with the leg and corresponds to the carpus (wrist). Five bones form the metatarsus, which corresponds to the metacarpus, and articulates with the tarsus behind, and with the toes in front. The foot is narrow and thick in its posterior part, thinner and broader anteriorly; it forms a right angle with the leg, and rests upon the ground at the extremities only. The middle portion is in the form of an arch, and, in consequence, resists shocks and supports pressure much better than it could if it were flat, and touched the ground throughout its whole length. And although the parts are very firmly united together, there is sufficient mobility to give great elasticity to the whole, and this elasticity is augmented by the toes. The foot thus supports the weight of the body like an arch and spring combined, giving it in this way great advantage in resistance.

FOOTA-JALLON, a considerable district of West Africa, Senegambia, intersected by lat. 11° N. and lon. 11° W. It is extremely mountainous, and remarkable for the romantic beauty of its scenery; and is the source of the rivers Senegal, Gambia, and Grande. During the rainy season the valleys, being inundated, are converted into lakes. Large herds and flocks are pastured in the highlands; and the soil produces in abundance oranges and bananas, besides numerous palm-trees, which furnish dates, wine, and oil. The inhabitants are fanatical Mohammedans, and pride themselves in their hatred of all infidels, except the whites, from whom they profess to be descended. They are governed by an elective chief. The capital, Timbo, contains a pop. of about 7000.

FOOT-AND-MOUTH DISEASE, a disease to which cattle are subject, and which is included among those provided against by the Contagious Diseases (Animals) Act of 1869 (which see). Its scientific name is *Eczema epizootica* and it is very contagious, being propagated by the saliva from the mouth, or by the matter from the foot of a diseased animal. It is thus easily spread among cattle drinking at the same watering-place or using the same road or yard.

FOOT-BALL, an outdoor game much practised in the public schools of England and Scotland, and by foot-ball clubs unconnected with any school. Foot-ball is a game of great antiquity. It has been identified in its ruder forms with the Spartan *sphairomachia*. In Scotland and the north of England the public celebration of foot-ball games on Shrove Tuesday seems to have been a custom of great antiquity. In London the game seems also to have been early introduced. Edward III. prohibited foot-ball in 1349, as one of the games likely to interfere with archery. In England Derby was particularly famous for the Shrove Tuesday games. They prevailed generally in Northumberland and Cumberland, and in Scotland in Perth, Midlothian, and other counties. In Perth the annual game was played between the bachelors and the married men. There were goals as in the modern game, but in these ancient celebrations the modern rules used to restrict the play seem to have been entirely unknown or honoured rather in the breach than the observance. The ancient game was a game of romps, a mingling of fun and violence, in which everything was lawful. The goals appear to have been fixed with some degree of humour, and often in such a way as to give the game no very defined boundaries, so that where it was played the town must perforce make holiday, and it was a scene of universal excitement in which, in Scotland at least, all ages and both sexes joined. The married women in Midlothian used to play annually against the single, and are said to have been generally victorious. On the border these games were carried on between the English and Scotch with a fierceness that partook of national rivalry, and the recollection of more serious conflicts. These annual celebrations have long fallen into disuse, and the game has only again acquired popularity in recent times. There is yet far from being any agreement as to the rules according to which it ought to be played. The old license of the game, in which every village made its own rules, and every player his own exceptions, has been definitely abandoned, but there are yet local customs and modes of play to be reconciled, which the frequency of public and even international matches has now rendered desirable.

The two most popular sets of rules appear to be the Rugby rules and the rules of the Foot-ball Association. In these rules, not only the method of play, but the object of the game is different, and both embrace so many details that we are unable to give a complete summary of either. In the Rugby game the ball must, to reach the goal, be kicked *over* a bar 10 feet high, in the Association game *under* a tape not more than 8 feet high. The game is played with a ball made of an ox-bladder, or now more commonly of an india-rubber bladder, covered with strong leather. The players are divided into two sides, each of which is commanded by a captain. The goals, through or over which it is the object of the players to drive the ball, are formed by posts, two of which are placed at each end of the field, each pair being equidistant from a central point. The two goals on each side are united by a transverse line, and lateral lines are supposed to run, or are indicated by flags from the goals on each side to those on the other, and are protracted indefinitely. The ball is not allowed to be sent outside of these lines, which is called being in touch; when it passes them it is

sent back by a kick at right angles from the lateral line. The line between the posts forming the goal by the Rugby rules must be 18 feet 6 inches in length; by the Association rules it is from 8 to 10 yards. Each goal is in possession of a keeper, and the rest of the party are distributed over the field according to the exigencies of the game. The ball must not be lifted from the ground or touched, except with the foot, unless it is caught in rebound, when, at least by the Rugby game, the player may run with it, and kick it dropping. When a goal is made, or at some other arranged interval, the parties change ground for the next struggle, so that any inequalities of situation may be balanced. The party winning most goals are the victors, but frequently no goal is won, and the next most difficult achievement, a touch down, is sometimes made to decide the game. This consists in carrying the ball, when caught, behind the line of the goal.

FOOTE, Samuel, a comic writer and actor, was born about 1720, at Truro, in Cornwall. He was educated at Worcester College, Oxford, and entered the Temple; but after a course of dissipation, to which his small fortune fell a sacrifice, he turned his attention to the stage. He appeared first in Othello, but had little success as a tragedian, and soon struck out an untrodden path for himself in his double character of author and performer. In 1747 he opened the little theatre in Haymarket, with a dramatic piece, which he entitled the Diversions of the Morning. It consisted of some very humorous imitations of well-known characters, in detached scenes, written by Foote, who always took the leading parts himself. It succeeded so well, that, in order to avoid the act for limiting the number of theatres, he repeated it under the title of Mr. Foote's giving Tea to his Friends. After 1752 he performed alternately in London and Dublin. He did not obtain a patent for the Haymarket till 1766, when, riding out with the Duke of York, he fell from his horse and broke his leg. In compensation for the accident the duke procured the patent for him. He died at Dover, October, 1777. Of his numerous plays, above twenty in number, hardly one is now acted. His humour appears to have been a personal gift, and is described by Dr. Johnson and other witnesses as irresistible.

FOOT-GUARDS. See Guards.

FOOT-POUND. The English engineer's unit quantity of work is the work of raising 1 lb. to a height of 1 foot, and it is called a foot-pound of work. A man is capable of doing about 1,000,000 foot-pounds of work in a day. See Force (Animal).

FORAGE, in military affairs, denotes the provisions brought into the camp by the troops for the sustenance of the horses.

FORAMINIFERA. The Protozoa, or simplest forms of animal forms—so simple that they have been grouped by Haeckel along with objects doubtfully vegetable in a kingdom, Protista, intermediate between the animal and vegetable kingdoms—are divided into *Rhizopoda*, *Infusoria*, and *Porifera* or sponges. The Rhizopoda fall into two natural groups, *Foraminifera* and *Radiolaria*, a third consisting of the Sun Animalcules (*Actinophrys*, &c.), whose position is intermediate. The Foraminifera are also named *Reticularia*, because the pseudopods or filamentous prolongations of the soft body anastomose freely and form networks around the main mass; and *Acytlaria*, because they possess no central capsule—characters in which they contrast with the *Radiolaria*, so named because the filaments are independent and radial, and known also as *Cytophora*, because they possess a central capsule. A Foraminifer consists of a gelatinous mass containing granules, but showing no other tendency towards structure. This mass is either naked, as *Lieberkühnia;* or inclosed in a membranous sac with a single opening, as *Gromia;* or possessed of a calcareous skeleton, as *Miliola*, *Nummularia*, and the majority of the group. When a test or shell exists the soft sarcode spreads over the outer surface, and in this external sheet the digestive process is probably carried on, only the products of digestion being carried into the interior of the shell. Dr. Carpenter has divided the Foraminifera into two groups, the Imperforate and the Perforate. To the former belong the families—1, *Gromida;* 2, *Miliolida;* 3, *Lituolida:* to the latter the families—4, *Lagenida;* 5, *Globigerinida;* and 6, *Nummulinida.* The classification is based on the absence or presence of apertures in the test, through which pseudopods may project in addition to those thrown out from the terminal orifice of the test. Under the Gromida comes *Lieberkühnia*, in which, though perhaps not absolutely naked, the test is reduced to a minimum, and its potential existence is manifested by the fact that projections occur at only one point of the surface. The membranous flask in which *Gromia* is lodged resembles that of *Arcella* among amœboids and of *Euglena* among Radiolarians; but in the former of these two the projections are lobate, and in the latter they do not anastomose. *Miliola*, the type of the second family, consists of a porcellaneous shell made up of chambers, each of which contains a sarcodic mass connected with the preceding and following, by a constricted portion or 'stolon.' The genus is of very wide distribution in space and time, and the varieties in the arrangement of the successive chambers characterize the types known as *Biloculina*, *Triloculina*, *Quinqueloculina*, *Spiriloculina*, &c. This genus is intermediate between *Squamulina*, which as a single-chambered (monothalamous) form is lowest in the series, and *Orbitelites*, a very complex many-chambered (polythalamous) form. In *Vertebralina* the chambers are arranged in linear order; in *Acicularia* successive rings of chambers may be piled so as to form a cylindrical stem with an open core. The *Lituolida* have arenaceous tests formed of foreign particles, the cement for which is furnished by the animal. The chambers are either in linear order or branched; or partly straight, partly curved; or alternately arranged in double series, but never forming complex spirals. The shell of the perforate Foraminifera is almost always vitreous or hyaline form of calcareous matter. Monothalamous forms are such as *Orbulina*, spherical; *Lagena*, flask-shaped; a linear succession of such flasks gives *Nodosaria;* and the bending of such a series culminates at last in the close, flat spiral of *Cristellaria*. Spheres like *Orbulina* grouped together yield the *Globigerina*, which takes so large a part in the calcareous deposits now forming on the floors of oceans; and the mode of aggregation may give very great complexity as well as yield curious resemblances to the forms of spiral shells. In these compound forms the chambers may open separately; in *Rotalia* each chamber opens into its successor, the last alone opening externally. The Nummuline group, the most complex of all, and that which has contributed most largely to the formation of rock masses, one great series of Tertiary limestones, being named from the predominance of Nummulites, offers varieties of form and arrangement unintelligible without elaborate diagrams. Enough has been said to show that the groups of Foraminifera are curiously parallel in their varieties of arrangement, and that they are reducible to certain simple types which may be looked on as primary. From the simplest imperforate species up to the Nummuline a gradation is traceable in the manner in which the successive chambers are connected;

symmetry predominates, but the aggregation is sometimes irregular or acervuline. But each cell may be connected with its neighbours, or rather the sarcodic masses in each cell may be connected by a stolon or constricted neck of sarcode, by this and coarse or fine tubules in addition, or besides by a highly complex canal system. Some forms are free, but many are firmly adherent to the surface on which they are found. The Eozoon has been identified as a Foraminifer by the possession of this complex series of communications between chambers which are both symmetrical and acervuline in their arrangement: the attachment of the Eozoon gives it a sponge-like aspect, in contrast with the definite shapes maintained even by the attached foraminifers of the present day. Foraminifera are universally distributed, and range from palæozoic times to the present day. The classification adopted here is that of Carpenter; but, long as the Foraminifera have been collected on account of their beauty as microscopic objects, their true relations are comparatively recently recognized. D'Orbigny even placed some of them among the Nautili, whose form they repeat. Future researches may therefore modify the classification of animals which present less difficulty on account of size than because of their great variability.

FORBES, DUNCAN, of Culloden, Lord-president of the Court of Session, was born at Bunchrew, near Inverness, 10th November, 1685. He entered on the study of law in Edinburgh in 1704. In 1705 he went to Leyden, then among the most celebrated universities on the Continent, and in 1707 returned to Scotland, where he continued the study of law till 1709, in which year he was admitted an advocate on 26th July. During his residence at Leyden, in addition to his legal studies, he made considerable progress in Hebrew and other oriental languages. Nearly all the Highland clans were at this time disaffected towards the government. The Forbeses were among the few who could be depended on. On the occasion of the rebellion of 1715, however, young Forbes saw clearly the impolicy of harsh proceedings, and exerted his powers of persuasion against them to such an extent as to excite a suspicion of his own loyalty. The weight of his character was sufficient to dissipate these doubts, and in 1716 he received the crown appointment of advocate-deputy. In 1722 he was returned to Parliament as the ministerial candidate for the Inverness district of boroughs, and in 1725 he was appointed lord-advocate. The first year of his holding this office a curious incident occurred. The introduction of the malt-tax into Scotland led to some riots in Glasgow, which the magistrates of that town were suspected of fomenting. Forbes proceeded thither from Edinburgh, accompanied by General Wade with a military force, arrested the whole of the magistrates on a justice of peace warrant, and after committing them to their own tolbooth, had them conveyed under a strong guard to Edinburgh, and thrown into the common jail, with the intention of proceeding against them in the justiciary court. Public feeling declared against this strong-handed proceeding, and as its legality was doubtful, the magistrates were liberated and no more was heard of the case. In 1734, in consequence of the death of his brother, John Forbes, he fell heir to the estate of Culloden. In 1736 Edinburgh was in turn the scene of the formidable disorders known as the Porteous mob riots. It was proposed to deprive the city of its privileges. Forbes exerted himself in its favour, and procured important modifications on the bill which passed through Parliament. The improvement of industry was a matter which the condition of the country rendered of the most urgent importance, the unsettled state of affairs having produced crowds of idlers. Into this enterprise Forbes entered with much pains and perseverance. He is said to have made himself master of the nature and history of almost every manufacture, and to have corresponded extensively with merchants and statesmen as to the means of introducing them into Scotland. He had the satisfaction of seeing his exertions crowned with success, and materially aided in laying the foundations of that commercial prosperity to which his country has since attained. In 1737 he was appointed president of the Court of Session, and applied himself with great zeal to the improvement of the regulations of that court. The cases were formerly taken up at the option of the chief judge, who could thus secure the absence of any judge whose opinion he believed to be hostile; Forbes fixed the order of procedure to that in which the cases stood on the roll. About the same time Forbes proposed a plan which, had it been adopted, might have prevented the rebellion of 1745. It was to organize the Highland clans into regiments under colonels of tried loyalty, so as to give them an interest in the existing order of things. But the jealousy of the government existing in Scotland prevented the execution of this plan from being attempted. Being privately advised of the rising in 1745 he hastened to Culloden, at which he arrived on 13th August. Many of the chieftains were under obligations to him, and his influence prevented several of them from joining the rebellion, and even secured the active support of some for the government. On the 15th October his house at Culloden was attacked by the Frasers, but the attack was repelled, and Lord Lovat, their chief, made him an ample apology, and afterwards sent a message to Charles Edward, requesting him to send and seize Forbes as his greatest enemy. When, after his retreat from England, Charles Edward arrived at Inverness, the lord-president took refuge in Skye, where he remained till after the battle of Culloden. Besides spending his own money in his exertions for the government, he had borrowed £1500 on his own responsibility from well-affected persons. It does not appear that he was ever remunerated. His health soon after began to decline, and he died on the 10th of December, 1747. He wrote several religious works: Thoughts on Religion; Reflections on the Sources of Incredulity in Regard to Religion; Letter to a Bishop; &c.

FORBES, EDWARD, an eminent naturalist, was born at Douglas, Isle of Man, on February 12, 1815, and was the second and eldest surviving child of Edward Forbes, Esq., of Oakhill and Croukbane, near Douglas. He evinced an early aptitude for the observation of natural objects, and among the favourite books of his boyhood were Fenton's Translation of the Systema Natura of Linnæus; Buckland's Reliquiæ Diluvianæ, and similar works, to which he attributed the bent of his life. During his school days he was in the habit of collecting and classifying minerals, fossils, shells, sea-weeds, wild flowers, and insects; and being of a delicate constitution he was encouraged in these pursuits, from their healthful tendency, by his father, who built for him a museum at his country house. He was not particularly distinguished at school, except for the dexterity he had acquired in handling the pencil, which was seldom out of his hands, the margins of his school-books and written exercises being covered with drawings of animals, caricatures, and grotesque figures, such as in future years he was wont to throw off with equal cleverness and humour. In his sixteenth year, having, as a compromise between his own inclinations and the wishes of his parents, made choice of painting as a profession, he went to London and placed himself under Mr. Sass, of Charlotte Street. After

four months' residence his want of vocation for this profession became manifest. His abilities might have sufficed to secure success, but his tastes lay in another direction. He now, in pursuance of the wishes of his father, proceeded to Edinburgh to study medicine, but during a formal attendance upon the medical classes he gave free scope to his natural inclinations, and at the close of his course did not even attempt to take his degree. He had already before entering the university made great advances in the study of natural history. He now became a frequenter of the University Museum, and enrolled himself in the classes of botany and natural history. He thus became acquainted with the actual state of science, and at the close of his university career was ready to add to its resources as an original observer. His first vacation ramble was to Norway, where he botanized for three months in company with a fellow-student, and made a narrow escape from shipwreck on his voyage home. Subsequently he betook himself zealously to the use of the dredge, which he successfully employed for many years in exploring the coasts of the British Islands. In the summer of 1835 he made a tour through France, Switzerland, and Germany, examining the natural history, inspecting the museums, and cultivating the acquaintance of the eminent naturalists of the countries in which he journeyed. Next year he returned to Paris and prosecuted his natural history studies at the Jardin des Plantes, and at the close of the winter course proceeded to the south of France, thence extending his excursion to Algiers, everywhere making acquisitions both in botany and zoology. The results of this tour were published in the Annals of Natural History. The winter of 1837–38 was spent at Edinburgh, where the labours of the session were diversified by new contributions to the college magazine, of which he had been an active supporter, and more especially by a series of snow-ball riots, in which Forbes took a leading part. The summer of 1838 was spent on the Continent, visiting Frankfort and Vienna, going through Styria and Carniola to Trieste, returning home by Venice, Milan, and the Simplon. At the British Association meeting in Newcastle this year he read a paper on the Distribution of Terrestrial Pulmonifera in Europe, and was intrusted by the association with the preparation of a report on the distribution of the Pulmoniferous Mollusca of the British Isles. From this time forward to the close of his life he was an active member of that great scientific body, the proceedings of its natural history section being every year enriched by the results of his investigations. In 1839 he lectured before the Edinburgh Philosophical Association on the animals in the British seas. Botany, zoology, and geology supplied materials for reports and papers to the British Association, the naturalists of which were induced by the sociable influence and example of Forbes and his friends to form themselves into a fraternity well known to the frequenters of Section D by the grotesque name of the Red Lions, and in the harmless eccentricities of which the most eminent naturalists of the day have often participated. In 1841 Forbes published the History of British Starfishes, a work not more esteemed for its original and accurate observations and vivid descriptions than it is admired for its pictorial illustrations and the ingenuity and quaint humour of its vignettes and tail-pieces. In the same year he accepted of an engagement as naturalist to the surveying squadron in the Mediterranean, and was rated on the books of H.M.S. *Beacon*, under the command of Captain Graves, who became thenceforward his fast friend. Before the summer was over, Forbes had dipped his dredge for the first time in the Grecian seas, and speedily surrounded himself amongst his naval comrades with an eager band of botanists, zoologists, and geologists. 'The first lieutenant,' says Capt. Graves, 'though anxious, as all first-lieutenants are, to keep the decks clean, never objected to the contents of the dredge being spread out, but almost became a convert.' Forbes made excursions over Paros, after exploring the flora and fauna of which, he availed himself of a triangulating cruise with Lieutenant Spratt to visit Naxia and other islands of the Cyclades. The general result of Forbes' investigations in these seas by means of the dredge was to establish the fact of the existence of 'a defined fauna different from any other of the marine zones, between 90 and 200 fathoms, and an exact correspondence in its productions over all the examined parts of the Ægean, a stretch of 200 miles.' Another cruise afforded him an opportunity of inspecting the shores of Asia Minor, where he visited the ruins of Xanthus and other ancient cities, ascended the mountains of Massicytus to a height of about 9000 feet, and examined the natural history of a country till then unexplored. An account of this tour was combined by Forbes with that of a later journey, and published in 1847, in conjunction with Lieutenant Spratt, under the title of Travels in Lycia. For two months after his first Lycian researches Forbes was employed, along with Capt. Graves, Sir C. Fellows, and Lieut. Spratt, in excavating and removing the Xanthian marbles; after which Forbes, Spratt, and the Rev. Mr. Daniell proceeded on the exploratory journey through Lycia, the results of which were published in the work already named. His return to England was hastened by the prospect of his being appointed to the chair of botany in King's College, London. On arriving in the Thames in October, 1842, he received the intelligence of his election to this office, to the duties of which were soon added those of curator of the collections of the Geological Society of London. But his new career made demands upon his time and labour which precluded the possibility of his addressing himself to the task of arranging and classifying the mass of materials collected by him in the Mediterranean; and we find him ere long complaining that while he is making abstracts, writing catalogues, and doing other people's work, the object that lay nearest his heart behoved to be put aside, adding characteristically that presently 'some rascally Frenchman would sift the Mediterranean, and claim the glory for his own country.' Both offices are described by him as 'hard work, no play, and little pay.' The great aim of his ambition was to fill the chair of natural history in the University of Edinburgh, and for ten long years he waited for the vacancy which fulfilled his utmost desires. In the meantime he devoted himself vigorously to his London work, occupying his few spare hours in preparing his Ægean researches for publication, for which Sir Robert Peel's government granted £500. The post of palæontologist to the Geological Survey, to which he was preferred in 1844, relieved him from the engrossing drudgery of his metropolitan life, and changes of scene and occupation restored him to his wonted health and spirits. Betwixt the years 1848 and 1852 he began and completed, in conjunction with Mr. Hanley, the well-known work descriptive of the British Mollusca, in four vols. 8vo. In 1848 he prepared for the Ray Society, in one vol. 4to, the Monograph of the Naked-eyed Medusæ. In the same year he was united in marriage to Miss Ashworth, daughter of the late General Sir C. Ashworth. On the opening of the School of Mines, in connection with the Museum of Practical Geology, Forbes was appointed lecturer on natural history as applied to geology and the arts. He still retained his profes-

sorship of botany at King's College, and continued to contribute annually some of his most valuable memoirs to the British Association, besides writing for scientific and literary journals. A Natural History of the European Seas was commenced and partly printed, but was left unfinished at his death, being afterwards completed by Mr. Austen. The professorship of natural history in the University of Edinburgh was at length, on the death of Jameson, conferred on Edward Forbes in 1854, and in the month of May of that year he left London to take his place as a teacher in the institution which two-and-twenty years before he had entered as a student. He was under the necessity of delivering his first summer course of lectures with little time for preparation, but the course, although entailing arduous labour in the way of illustration, was in every respect most successful. His lectures embraced zoology and geology, the latter including, of course, palæontology; and one of the most memorable features of his lecturing was the facility and grace with which he drew on the blackboard outlines of the animal structures which he described, the movement of his hand in delineating these forms being often followed by an involuntary murmur of admiration on the part of the audience. At the Liverpool meeting of the British Association in the same year he was elected president of the geological section. He returned to Edinburgh some weeks before the opening of the college session, and had only commenced his class when he evinced some symptoms of the recurrence of the remittent fever he had caught in Greece. In spite of the best medical skill and the suspension of his lectures, the febrile symptoms increased, and he died on Nov. 18, 1854, aged 39. His active public life did not exceed five-and-twenty years, but into that period were crowded the labours and triumphs of the longest career; yet his work was only half done; and, as was remarked of the father of modern geology, the loss sustained by his death was aggravated by the consideration of how much of his knowledge had perished with himself, and notwithstanding all that he had written, how much of the light collected by a life of experience and observation was now extinguished. Forbes became a fellow of the Royal Society in 1845. (Memoir of Edward Forbes, by Prof. George Wilson, continued by Archibald Geikie of the Geological Survey.)

FORBES, James David, natural philosopher, was born at Colinton, near Edinburgh, 20th April, 1809. He was educated at the University of Edinburgh, and admitted to the Scottish bar in 1830. In 1833 he was appointed to the chair of natural philosophy in the University of Edinburgh. In 1860 he became principal of the United Colleges of St. Salvador and St. Leonard, in the University of St. Andrews. He died at Clifton, 31st December, 1868. Professor Forbes was in 1842 made a corresponding member of the Institute of France, and he had numerous medals from the Royal Society, and other scientific associations; but his fame rests chiefly on his study of glaciers. His chief publications on this subject are: Travels through the Alps of Savoy (1843); Norway and its Glaciers (1853); Tour of Mont Blanc and Monte Rosa (1855); and Occasional Papers on the Theory of Glaciers (1859). Forbes' theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts. A controversy was begun between Dr. Tyndall and Forbes, and continued by Forbes' friends after his death, as to the first suggestion of this theory, which Tyndall claimed for Rendu. It seems that in any case Forbes was not aware of the result of Rendu's investigations at the time of making his own. See the article Glacier for further information on this subject.

FORBES, Sir John, an eminent physician, born in Banffshire in 1787. He received his professional education at Marischal College, Aberdeen, and the University of Edinburgh, graduating M.D. at the latter in 1817. Previous to this time he had been a surgeon in the royal navy, from which he retired on half-pay in 1816. He first settled at Penzance, and afterward at Chichester. In 1840 he settled in London, and soon became physician extraordinary to the Prince Consort, and physician to the Queen. In 1853 he was knighted. He died at Whitchurch, Oxfordshire, 13th November, 1861. His first works which brought him into notice among his brethren were his translations of the writings of Avenbrugger and Laennec, on auscultation and the use of the stethoscope, especially his translation of Laennec, which has gone through several editions. They had the merit of turning the attention of the medical faculty in this country to the improved methods of physical diagnosis which now form so important a part of medical practice. In the latter part of 1833 he arranged the plan of the Cyclopædia of Practical Medicine, which was completed in 1835, and as editor of it, along with Dr. Conolly, he contributed some of the best articles in the work. He was also the founder of the British and Foreign Medical Review, and its editor until its union with Medico-Chirurgical Review changed its name into that of the British and Foreign Medico-Chirurgical Review. In 1849 he published A Physician's Holiday, or a Month in Switzerland; in 1852, Memoranda made in Ireland in the Autumn of 1852; in 1856, Sight-seeing in Germany and the Tyrol in the Autumn of 1855; and in 1857, Nature and Art in the Cure of Disease.

FORBES MACKENZIE ACT. An act for the better regulation of the public-houses of Scotland, passed 15th August, 1853 (16 and 17 Vict. cap. lxvii.), is popularly known by this title, as it was introduced in the House of Commons by Forbes MacKenzie, member for Liverpool, although its author was Lord Kinnaird. See Licensing Acts.

FORCE. That which produces, or tends to produce motion is called force. The muscular power of animals, pressure, the attraction of gravity, electric and magnetic attraction, are forces. Impact also may give rise to the exhibition of elastic forces, and so may any kind of strain produced in elastic bodies. Here the recoil after the impact, or the tendency of the elastic body which has been strained or compressed to recover its original form or volume, gives rise to the motion. Forces are measured in two ways. Either they are measured by their effect in producing motion, or else they are compared with the force of gravity. The latter is a very common mode of reckoning for ordinary purposes. Thus steam pressure is reckoned in pounds weight per square inch of the surface exposed to it; and the breaking stress of a wire may be stated in terms of the number of pounds weight that just suffice to break it. Here the pressure on the surface of the boiler per square inch, and the bearing power of the wire, are compared with the force with which a 1 lb. mass is attracted towards the earth. On this system of measurement the unit of force is the weight (that is, the downward pressure under gravity) of the unit of mass. Thus, in English measurements, the weight of 1 lb. is the unit of force; in the metrical system the weight of 1 gramme is the unit. This system is distinguished by scientific writers from that which is about to be described by the name *gravitation measure*. The weight of 1 lb. is the *British gravitation unit of force*.

It will be understood from our article Gravity that the force of gravity varies from place to place on the earth's surface, and that it varies also if we

leave the earth's surface either by ascending into the air or by descending into the earth—for example, into a deep mine. For this reason a 1 lb. mass would be found to have slightly different weights, if tested by a spring balance, in different localities. The unit of force is thus seen to be variable; and although these variations are so slight that the effect of them is imperceptible in such cases as that of steam pressure, or the other that we have instanced, nevertheless a variable unit is plainly altogether unsuitable for scientific purposes. A unit founded on the effect of force in producing motion is therefore defined in the following way, and it is known as the *absolute unit of force*, or, which is better, the *kinetic unit of force*. The kinetic unit of force is the force that is capable of generating unit quantity of motion in unit of time. As unit quantity of motion is defined to be (see MOMENTUM) unit of mass moving with unit velocity, the unit of force may be defined as a force which, if allowed to act freely on unit of mass for unit of time, would generate in it unit velocity; and if we choose as our units of mass, length, and time the British pound and foot, and the second, we may say, specifically, that the British kinetic unit of force is the force which, if applied to a mass of 1 lb. for a second of time, would give that mass a velocity of 1 foot per second. The unit here explained is found to have great convenience for scientific calculations; the simplification that it introduces into explanations and formulas in dynamics is of great importance. It may readily be compared with the ordinary engineer's unit, the weight of a pound, in the following way. It is known by experiment that a body allowed to fall freely from rest acquires, in our latitude, a velocity of 32·2 feet per second in one second. Thus a pound allowed to fall freely acquires that velocity. The acting force that sets the pound mass in motion is, it is plain, its own weight; that is to say, the gravitation unit of force applied to unit of mass generates in one second a velocity of 32·2 feet per second; thus the weight of a pound, in our latitude, is 32·2 kinetic units of force.

The effects of a force depend on the circumstances under which the force is applied. It may be applied so as to compel rest or to prevent change of motion, or it may be applied so as to produce or to change the motion of bodies. Dynamics is the branch of science under which the effects of forces are considered: the name Mechanics, however, is the popular name under which this branch of science goes. When a force is applied so as to produce motion against resistance, or to overcome resistance to the motion, the force is said *to do work*. Under WORK will be found some particulars on this subject.

FORCE, ANIMAL (applied to perform work). All machines are impelled either by the exertion of animal force or by the application of the powers of nature. The latter comprise the potent elements of water, air, and fire. The former is more common, yet so variable as hardly to admit of calculation. It depends not only on the vigour of the individual, but on the different strength of the particular muscles employed. Every animal exertion is attended by fatigue; it soon relaxes, and would speedily produce exhaustion. The most profitable mode of applying the labour of animals is to vary their muscular action, and revive its tone by short and frequent intervals of repose. The ordinary method of computing the effects of human labour is from the weight which it is capable of elevating to a certain height in a given time. This was reckoned by Daniel Bernouilli and Desaguliers at 2,000,000 lbs. avoirdupois, which a man could raise 1 foot in a day. But our civil engineers have gone much farther, and are accustomed, in their calculations, to assume that a labourer will lift 10 lbs. to the height of 10 feet every second, and is able to continue such exertion for ten hours each day, thus accumulating the performance of 3,600,000 foot-pounds of work per day. But this estimate seems to be drawn from the produce of momentary exertions under the most favourable circumstances; and it therefore greatly exceeds the actual results, as commonly depressed by fatigue, and curtailed by the unavoidable waste of force. Coulomb has furnished the most accurate and varied observations on the measure of human labour. A man will climb a stair, from 70 to 100 feet high, at the rate of 45 feet in a minute. Reckoning his weight at 155 lbs., the animal exertion for one minute is 6975, and would amount to 4,185,000 if continued for ten hours; but such exercise is too violent to be often repeated in the course of a day. A person may clamber up a rock 500 feet high, by a ladder-stair, in twenty minutes, and, consequently, at the rate of 25 feet each minute; his efforts soon begin to be impaired, and the performance reaches only 3875 lbs. in a minute. But, under the encumbrance of a load, the quantity of action is still more remarkably diminished. A porter, weighing 140 lbs., was found willing to climb a stair 40 feet high 266 times in a day; but he could carry up only sixty-six loads of firewood, each of them 163 lbs. weight. In the former case his daily performance was very nearly 1,500,000; while in the latter it amounted only to 808,000. The quantity of permanent effect was hence only about 700,000, or scarcely half the labour exerted in mere climbing. In the driving of piles, a load of 42 lbs., called the *ram*, is drawn up 3½ feet high twenty times in a minute; but the work has been considered so fatiguing as to endure only three hours a day. This gives about 530,000 for the daily performance. Nearly the same result is obtained by computing the quantity of water which, by means of a double bucket, a man drew up from a well. He lifted 36 lbs. 120 times in a day from a depth of 120 feet, the total effect being 518,400. A skilful labourer, working in a field with a large hoe, creates an effect equal to 728,000. When the agency of a winch is employed in turning a machine, the performance is still greater, amounting to 845,000. The following observations will also be found interesting, although it is not possible to express them in terms of foot-pounds of work done. The idea of doing work necessarily involves resistance to the force that is doing the work. In the case of horizontal transport we have in most cases no means of estimating the amount of resistance encountered. A porter in London is accustomed to carry a burden of 200 lbs. at the rate of 3 miles an hour. This is greatly inferior, however, to the labour performed by porters in Turkey, the Levant, and generally on the shores of the Mediterranean. At Constantinople an Albanian porter will carry 800 or 900 lbs. on his back, stooping forward, and assisting his steps by a sort of staff. At Marseilles four porters commonly carry the immense load of nearly 2 tons by means of soft hods passing over their heads and resting on their shoulders, with the ends of poles, from which the goods are suspended. The Greek seamen, in the Dardanelles, are esteemed more skilful and vigorous in the act of rowing than those of any other nation. The Chinese, applying both their hands and their feet, are said to surpass all people in giving impulsion to boats by sculling. The several races of men differ materially in strength, but still greater diversity results from the constitution and habits of the individual. The European and his American descendants are, on the whole, more powerful than the other inhabitants of the globe; and man reared in civil-

ized society is a robuster and more vigorous animal than the savage. In the temperate climates, likewise, men are capable of much harder labour than under the influence of a burning sun. Coulomb remarks that the French soldiers employed on the fortifications of the Isle of Martinique became soon exhausted, and were unable to perform half the work executed by them at home. The most violent and toilsome exertion of human labour is performed in Peru by the carriers or *cargueros*, who traverse the loftiest mountains, and clamber along the sides of the most tremendous precipices, with travellers seated in chairs strapped to their backs. In this manner they convey loads of 12, 14, or even 18 stone; and possess such strength and action as to be able to pursue their painful task eight or nine hours for several successive days. When a man stands, he pulls with the greatest effect; but his power of traction is much enfeebled by the labour of travelling. If v denote the number of miles which a person walks in an hour, the force in pounds pressure which he exerts in dragging forward a load will be expressed nearly by $\frac{1}{5}(12-2v)^2$. Thus, when at rest, he pulls with a force of about 29 lbs. avoirdupois; but if he walks at the rate of 2 miles an hour his power of traction is reduced to 14 lbs.; and if he quicken his pace to 4 miles an hour, he can draw only 3 lbs. There is, consequently, a certain velocity which procures the greatest effect, or when the product of the traction by the velocity becomes a maximum. This takes place when he proceeds at the rate of 2 miles an hour. The utmost exertion which a man, walking, might continue to make, in drawing up a weight by means of a pulley, would amount, therefore, in a minute, only to 2430; but if he applied his entire strength, without moving from the spot, he could produce an effect of 3675.

The labour of a horse in a day is commonly reckoned equal to that of five men; but then he works only eight hours, while a man easily continues his exertions for ten hours. Horses, likewise, display much greater force in carrying than in pulling; and yet an active walker will beat them on a long journey. Their power of traction seldom exceeds 144 pounds, but they are capable of carrying more than six times as much weight. The pack-horses in the West Riding of Yorkshire are accustomed to transport loads of 420 lbs. over a hilly country. But in many parts of England the mill-horses will carry the enormous burden of 910 lbs. to a short distance. With regard, however, to the ordinary power of draught, the formula $(12-v)^2$, where v denotes the velocity in miles an hour, will perhaps be found sufficiently near the truth. Thus a horse, beginning his pull with the force of 144 lbs., would draw 100 lbs. at a walk of 2 miles an hour, but only 64 lbs. when advancing at double that rate, and not more than 36 lbs. if he quickened his pace to 6 miles an hour. His greatest performance would hence be made with the velocity of 4 miles an hour. The work in a minute will then amount to 22,528. The measure generally adopted for computing the power of steam-engines is much higher, the labour of a horse being reckoned sufficient to raise, every minute, to the elevation of 1 foot, the weight of 33,000 lbs. But this estimate is not only greatly exaggerated, but should be viewed as merely an arbitrary and conventional standard. Wheel carriages enable horses on level roads to draw, at an average, loads about fifteen times greater than the power exerted. The carriers between Glasgow and Edinburgh transported, in a single horse cart, weighing about 7 cwt., the load of a ton, and travelled at the rate of 22 miles a day. At Paris, one horse, in a small cart, conveys along the streets half a cord of wood, weighing 2 tons; but three horses yoked in a line are able to drag 105 cwt 5¼ lbs., or that of a heavy cart loaded with building stones. The Normandy carriers travel from 14 to 22 miles a day, with two-wheeled carts, weighing each 11 cwt., and loaded with 79 cwt., or nearly 4 tons, of goods, drawn by a team of four horses. The French draught-horses, thus harnessed to light carriages, are more efficient, perhaps, than the finer breeds of England. They perform very nearly as much work as those in the single horse carts used at Glasgow, and far greater than those heavy animals which drag the lumpish and towering English waggons. The London dray-horses, in the mere act of ascending from the wharfs, display a powerful effort, but they afterwards make little exertion, their force being mostly expended in transporting their own ponderous mass along. Oxen, on account of their steady pull, are in many countries preferred for draught. They were formerly employed universally in the various labours of husbandry. The tenderness of their hoofs, unless shod, however, makes them unfit for pulling on paved roads, and they can work only with advantage in soft grounds. But they want all the pliancy and animation which are the favourite qualities of the horse. The patient drudgery of the ass renders him a serviceable companion of the poor. Much inferior in strength to the horse, he is maintained at far less cost. In temperate climates an ass will carry about 2 cwt. 22 miles a day. But in the warmer climates he becomes a larger and finer animal, and trots or ambles briskly under a load of 150 lbs. The mule is still more powerful and hardy, being fitted equally for burden and draught. In the hotter parts of Asia and Africa the ponderous strength of the elephant has been long turned to the purposes of war. He is reckoned more powerful than six horses, but his consumption of food is proportionally great. The elephant carries a load of 3000 or 4000 lbs; his ordinary pace is equal to that of a horse trot; he travels easily over 40 or 50 miles in a day, and has been known to perform in that time a journey of 110 miles. His sagacity directs him to apply his strength according to the exigency of the occasion. The camel is a most useful beast of burden in the arid plains of Arabia. The stronger ones carry a load of 10 or 12 cwt., and the weaker ones transport 6 or 7 cwt.; they walk at the rate of 2½ miles an hour, and march about 30 miles every day. The camel travels often eight or nine days without any fresh supply of water. When a caravan encamps in the evening he is perhaps turned loose, for the space of an hour, to browse on the coarsest herbage, which serves him to ruminate during the rest of the night. In this manner, without making any other halt, he will perform a dreary and monotonous journey of 2000 miles.—Within the Arctic circle, the reindeer, as a domesticated animal, is not less valuable. He not only feeds and clothes the poor Laplander, but transports his master with great swiftness in a covered sledge over the snowy and frozen tracts. The reindeer subsists on the scanty vegetation of moss or lichens, and are docile, but not powerful. Two of them are required to draw a light sledge: so harnessed, they will run 50 or 60 miles on a stretch, and sometimes perform a journey of 112 miles in the course of a day. But such exertions soon wear them out. The llama of South America is commonly used as a beast of burden in Peru and other parts, and is, indeed, peculiarly fitted for the lofty regions of the Andes. The strongest of them carry only from 150 to 200 lbs., but perform about 15 miles a day over the roughest mountains. They generally continue this labour during five days, and are then allowed to halt two or three days before they renew their task.

The paco is another similar animal, employed likewise in transporting goods; it is very stubborn, however, and carries only from 50 to 70 lbs. Even the exertions of goats have, in some parts of Europe, been turned to useful labour. They are made to tread in a wheel which draws water or raises ore from the mine. Though a small animal, the goat exerts much force, as he climbs at a high angle. Supposing it, though only the fourth part of the weight of a man, to march as fast along an ascent of 40° as the man over one of 18°—the size of the former being double that of the latter—it must perform half as much work as he.

FORCELLINI, EGIDIO, an Italian philologist, celebrated as a lexicographer, was born 1688, in a village not far from Feltre, in the ancient Venetian territory. The poverty of his parents prevented him from going to school, and he was almost grown up when he began to study Latin in the seminary at Padua. His teacher in this language, who soon became his friend, was Professor Facciolato. Forcellini made rapid progress in the ancient languages, and assisted Facciolato in his new and greatly augmented edition of Calepin's dictionary of seven languages. The two friends then resolved to publish a complete Latin dictionary. But the execution of this project was long delayed by Forcellini's being appointed professor of rhetoric and president of the seminary at Ceneda, in the Trevisan. But having been recalled to Padua in 1731, and having obtained, through the patronage of the bishop of that city, Cardinal Rezzonico, sufficient leisure to prosecute his task, he finished it under the direction of Facciolato. It was published under the title Ægidii Forcellini totius Latinitatis Lexicon, &c. (Padua, 1771, four vols. folio)—a monument of erudition and accurate knowledge of the Latin tongue. Forcellini died in 1768.

FORCEPS, in surgery, &c., a pair of scissors for cutting off or dividing the fleshy membranous parts of the body, as occasion requires.

FORCES, COMPOSITION AND RESOLUTION OF. See MECHANICS.

FORCIBLE DETAINER, in English law, is the refusal to restore the goods of another, although lawfully in possession of the holder, after sufficient amends have been tendered. The remedy is an action of trover. If the goods were unlawfully possessed originally the detainer is a criminal offence.

FORCIBLE ENTRY (English law) is the violently taking possession of lands or tenements with arms or menaces. By the ancient common law, he who had the right of entry into lands might make entry by force; but, this liberty being abused, a statute was passed in the time of Richard II., and subsequently other statutes, subjecting a party who should make forcible entry into lands to indictment for breach of the peace, and provision has also been made for a summary process to be issued by two justices of the peace for the purpose of restoring the party thus forcibly expelled, or kept out of his lands, to the possession.

FORCING, a method of cultivation employed by gardeners for the purpose of producing vegetables or fruits, by artificial heat, before their proper season. The cultivation of exotic plants and trees in hot-houses, in which a temperature is kept up corresponding to that of the country to which they belong, is not, therefore, forcing in the proper sense, as these usually flower and fruit at their proper seasons. Forcing is by no means a modern invention. It was practised by the Romans in the times of the first emperors, and the table of Tiberius was supplied with cucumbers all the year round by this means, the method being not greatly different from that still employed. Heat was obtained by frames filled with hot dung, and light was admitted through thin plates of talc, which would doubtless answer the purpose exceedingly well, especially under the strong light of an Italian sky. Dung-beds are still largely used for forcing, though, of course, hot-water pipes are also extensively employed to give the requisite heat, while glass has taken the place of the plates of talc. A large number of vegetables and fruits are now forced, but the process is necessarily, in many cases, very expensive. Among vegetables we may notice the asparagus, carrot, cucumber, kidney-bean, lettuce, mushroom (this is successfully grown in the dark), potato, sea-kale, radish, and rhubarb; among fruits, the apricot, cherry, fig, gooseberry and currant, peach, pine-apple, strawberry, plum, and grape. Differences naturally exist between the methods employed for each, but we cannot enter upon details in this work.

FORD, JOHN, an early English dramatic author, was born in Devonshire in 1586, and entered the Middle Temple in 1602, for the purpose of studying law. While there he published, in 1606, a piece entitled Fame's Memoriall, a species of monody on the Earl of Devonshire, which poem, considered as the production of a youth, exhibits great freedom of thought and command of language. He printed his first tragedy of the Lover's Melancholy in 1629. This, however, was not his first play, as a piece of his, entitled A bad Beginning makes a good Ending, was previously acted at court. He wrote, or assisted to write, at least eleven dramas; and such as were printed appeared from 1629 to 1634. Most of these were exclusively his own composition; but somes of them were written in conjunction with Decker, Drayton, Hatherewaye, and others. The date of his death is uncertain; but it is thought that he did not long survive 1639. As a dramatic writer he is often elegant and elevated, and uniformly easy and harmonious. His genius was most inclined to tragedy, but he was too fond of an accumulation of terrific incidents, which overlays the natural pathos in which he was by no means deficient. Besides the works already mentioned, a writer in the Censura Literaria has attributed to him an able little manual, entitled A Line of Life pointing to the Immortalitie of a Vertuous Name (1620, 12mo).

FORDUN, JOHN, the father of Scottish history, is supposed to have been a native of Fordoun, in Kincardineshire, towards the close of the reign of Alexander III. His design in composing his history was to supply the loss his country had sustained by the carrying away of its annals by Edward I. To procure materials for his work he is said to have travelled on foot in England, Scotland, and Ireland. His history was written, or at anyrate completed, between 1384 and 1387. He thought it due to the honour of his country to give a great antiquity to its monarchy, consequently a great part of his history, which begins with the creation, is fabulous, but the authentic part of it is not to be judged altogether by the same standard; and where, in matters near his own day, he differs from Buchanan and others, he may have had better means of information than they. He wrote the first five books of the Scotichronicon, bringing it down to 1153, and part of the sixth, and left materials for its continuation down to his own period, about 1385. The work was speedily diffused among the convents of his own country and those of England, and formed the basis for many subsequent histories. It was resumed about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun were enlarged, and eleven new ones added, bringing the history down to 1437. Thomas Hearne published an edition of Fordun's own work, with a continuation, at Oxford, in 1722. An-

other edition, with Bower's continuation, was published at Edinburgh by Goodall in 1759. The best edition of Fordun's history is that edited by W. F. Skene, Edinburgh, 1871–72, two vols. (the first containing the text, the second translation, notes, &c.)

FORE, the distinguishing character of all that part of a ship's frame and machinery which lies near the stem.

FORE AND AFT, throughout the ship's whole length, or from end to end; it also implies, in a line with the keel.

FORE BOW-LINE, the bow-line of the foresail. See BOW-LINE.

FORE BRACES, ropes applied to the fore yard-arms to change the position of the foresail occasionally.

FORECASTLE, a short deck placed in the fore part of a ship, above the upper deck; it is usually terminated, both before and behind, in vessels of war, by a breastwork, the foremost part forming the top of the beak-head, and the hind part reaching to the after-part of the fore-chains.

FORECASTLE MEN, sailors stationed on the forecastle, who are generally prime seamen.

FORECLOSED, in law, signifies the being shut out, and excluded or barred the equity of redemption on mortgages, &c.

FORECLOSURE, in English law, is the right of a mortgagee, or of any one having interest in a mortgage, in the event of the conditions of the mortgage being violated, to compel the mortgager to redeem the pledge or forfeit his right of redemption. This is done by filing a bill for foreclosure. By 15 and 16 Vict. cap. lxxxvi. the court may, on application of the mortgagee, mortgager, or any encumbrancer of the mortgage, grant, under certain conditions, a sale of the subject instead of foreclosing the mortgage.

FOREIGN ATTACHMENT. See ATTACHMENT (FOREIGN).

FOREIGN BILL OF EXCHANGE. See BILL —Bill of Exchange.

FOREIGN ENLISTMENT. See ENLISTMENT.

FORELAND, a cape or promontory projecting into the sea, as the North and South Forelands.

FORESHORTENING, in drawing and painting, the art of representing figures of all sorts as they appear to the eye in oblique positions. This art, which in many instances is very difficult, was known to the Greeks; and Pliny speaks particularly as to its being successfully practised by Parrhasius and Pausias. Among the moderns, Correggio must be allowed the palm for excellence in foreshortening. In painting ceilings it is particularly important. In a celebrated picture of the body of Christ lying horizontally, the figure is so much foreshortened that the toes almost touch the chin.

FORESTALLING. See ENGROSSING, FORESTALLING, AND REGRATING.

FOREST MARBLE, in geology, a member of the Lower Oolite formation. See GEOLOGY.

FORESTS. The great importance of wood to society, and the rapid decrease of forests in populous countries, if particular care is not taken of them, have led, in modern times, to a careful investigation of the subject of the management of forests, and everything connected with it. The Germans, who first taught mining as a science, were the first who treated scientifically of the management of forests and established forest academies, in which all branches of the knowledge relating to them are taught. These establishments originated from the increasing scarcity of wood, which rendered the careful management of the forests necessary, and from the plan of raising a revenue on the part of the government by the sale of the wood. Mr. Zanthier first introduced instruction in the forest sciences as a particular branch of study at Ilsenburg, in Stolberg-Wernigerode, near the Hartz Mountains. Prussia soon directed her attention to them; and at present no person in that country is appointed to an office in the forest department without having undergone a strict examination in the branches of knowledge connected with the forests, and having served personally in the forests for a considerable length of time. There are a number of forest academies in different parts of Germany, particularly in the small states of central Germany, in the Hartz, Thuringia, &c. The principal branches taught in them are the following: forest botany, mineralogy, zoology, chemistry, by which the learner is taught the natural history of forests, and the mutual relations, &c., of the different kingdoms of nature. He is also instructed in the care and chase of game, and in the surveying and cultivation of forests, so as to understand the mode of raising all kinds of wood, and supplying a new growth as fast as the old is taken away. The pupil is also instructed in the administration of the forest taxes and police, and all that relates to forests considered as a branch of revenue. France has likewise paid attention to her forests, and has enacted a *code forestier*.

The English forest laws have reference only to the preservation of game—'With regard (says Blackstone, Com. vol. ii. page 413) to the rise and original of the present civil prohibitions on the destruction of game in Europe, it will be found that all forest and game laws were introduced into that part of the world at the same time, and by the same policy as the feudal system, when the swarms of barbarians issued from their northern hive, and laid the foundation of most of the present kingdoms of Europe on the ruins of the Western Empire. For when a conquering general came to settle the economy of a vanquished country, and to part it out among his soldiers or feudatories, who were to render him military service for such donations, it behoved him to keep the natives of the country, and all persons who were not his military tenants, in as low a condition as possible, and especially to prohibit them the use of arms. Nothing could do this more effectually than a prohibition of hunting or sporting; and therefore it was the policy of the conqueror to reserve this right to himself and those on whom he should bestow it, who were only his capital feudatories or greater barons. And accordingly we find in the feudal constitution one and the same law prohibiting the *rustici* in general from bearing arms, and also proscribing the use of snares, nets, or other engines for destroying the game. This exclusive privilege well suited the martial genius of the conquering troops, who delighted in a sport which, in its pursuit and slaughter, bore some resemblance to war. And, indeed, like some of their modern successors, they had no other amusement to entertain their vacant hours, despising all arts as effeminate, and having no other learning than was couched in such rude ditties as were sung at the solemn carousals which succeeded these ancient huntings. And it is remarkable that, in those nations where the feudal policy remains most uncorrupted, the forest or game laws continue in their highest rigour.

'In France all game was properly the king's; and in some parts of Germany it is death for a peasant to be found hunting in the woods of the nobility. In Britain also hunting has always been esteemed a most princely diversion and exercise. The whole island was replenished with all sorts of game in the times of the Britons, who lived in a wild and pastoral manner without inclosing or improving their

grounds, and derived much of their subsistence from the chase, which they all enjoyed in common. But when husbandry took place under the Saxon government, and lands began to be cultivated, improved, and inclosed, the beasts naturally fled into the woody and desert tracts, which were called *forests*, and not having been disposed of in the first distribution of lands, were therefore held to belong to the crown. These were filled with great plenty of game, which our royal sportsmen reserved for their own diversion on pain of a pecuniary forfeiture on the part of such as interfered with their sovereign. But every freeman had the full liberty of sporting upon his own territories, provided he abstained from the king's forests. However, upon the Norman Conquest, a new doctrine took place, and the right of pursuing and taking all beasts of chase or venery and such other animals as were accounted game was held to belong to the king, or to such only as were authorized under him. The right thus newly vested in the crown was exerted with the utmost rigour at and after the time of the Norman establishment, not only in the ancient forests, but in the new ones which the Conqueror made by laying together vast tracts of country depopulated for that purpose, and reserved solely for the king's royal diversion; in which were exercised the most horrid tyrannies and oppressions, under the colour of forest law, for the sake of preserving the beasts of chase; to kill any of which, within the limits of the forest, was as penal as the death of a man. And in pursuance of the same principle King John laid a total interdict upon the *winged* as well as the four-footed creation: 'capturam avium per totam Angliam interdixit.' The cruel and insupportable hardships which those forest laws created to the subject occasioned our ancestors to be as zealous for their reformation as for the relaxation of the feudal rigours and the other exactions introduced by the Norman dynasty, and accordingly we find the immunities of *carta de foresta* as warmly contended for, and extorted from the king with as much difficulty as those of *magna carta* itself. By this charter, confirmed in Parliament, many forests were disafforested or stripped of their oppressive privileges; and regulations were made in the regimen of such as remained; particularly killing the king's deer was made no longer a capital offence, but only punished by a fine, imprisonment, or abjuration of the realm. And by a variety of subsequent statutes, together with the long acquiescence of the crown without exerting the forest laws, this prerogative is now become no longer a grievance to the subject.' The royal forests of Scotland were as numerous, and the laws regarding them as oppressive, as those of England.

A forest in English law consists in the right or privilege of keeping wild animals and fowls within a precinct of territory for the purposes of breeding and hunting. It is an incorporeal and hereditary possession belonging to the sovereign, but capable of being vested in the subject. The charter alluded to in the above extract from Blackstone, the ninth act of Henry III., was the first statute by which the forest law was explicitly determined. There were formerly forest courts in England for the administration of the laws relating to forests, but they, as well as the forest laws themselves, have, since the Revolution of 1688, fallen completely into desuetude.

FORETOP MEN, men stationed in the foretop, in readiness to set or take in the smaller sails, and to keep the upper rigging in order.

FORFAR, or ANGUS, a maritime county on the east coast of Scotland, bounded N. by counties Aberdeen and Kincardine, W. by Perth, S. by the Firth of Tay, and E. by the German Ocean; length, north-west to south-east, 36 miles; breadth about 30 miles; area, 568,750 acres. The surface is traversed by two nearly parallel ranges; in the north-west by a portion of the Grampians, known by the name of the Braes of Angus, nowhere exceeding 2611 feet; and considerably to the south by the Sidlaw Hills, not more than 1400 feet, but presenting several conical summits, among which the Dunsinnane Hill of Shakspeare is conspicuous. Between the Grampians and the Sidlaw Hills lies the large and beautiful valley of Strathmore, and between the Sidlaw Hills and the Tay is the level but rich and highly cultivated tract of which the Carse of Gowrie forms a part. All the operations of agriculture and grass husbandry are carried on in their most approved form, and the crops of wheat especially, and of oats, barley, potatoes, and turnips, are scarcely surpassed by those of any county in Scotland. Cattle of various breeds are reared. The native sheep, a small white-faced mountain-breed, have to some extent given place to the black-faced and cheviot breeds, but some of the original stock are still to be found in the Grampians. The total area under cultivation in 1872 was 241,493 acres, of which 214,573 were under corn and other rotation crops, and 26,216 under permanent pasture. The number of cattle of all kinds in 1872 was 49,320, of sheep 116,109, of agricultural horses 9324. The staple manufacture is coarse linen, which is more or less diffused through all the towns and villages, but has its central locality at Dundee. No minerals of any consequence are wrought, except pavement, for which the quarries of Carmylie, better known as Arbroath, have long been famous. Limestone and slate are found but not much wrought. Forfar returns one member to Parliament, and Dundee and the Montrose district of boroughs return one each. Pop. in 1871, 237,567.

FORFAR, the capital of the above county, in the valley of Strathmore, and on the railway from Perth to Aberdeen, 13 miles N. by E. of Dundee. It consists of two principal and several minor streets, lined with houses which, though irregularly built, are often of a superior description. The chief buildings besides the churches are a handsome county hall and court-house, mechanics' institute, &c. The staple manufactures are linen, chiefly sheetings, osnaburgs, and dowlas, and a kind of shoes called brogues, largely made for exportation. Forfar is one of the Montrose district of burghs. Pop. in 1871, 11,031.

FORFEITURE, in law, the effect of a transgression or offence, as the loss of privilege, right, estate, honour, office, or effects, either in *civil* or *criminal* cases. In *civil* cases, as when a tenant in tail makes leases not warranted by the statute, a forfeiture is committed, and he who has the immediate reversion may enter upon possession. In *criminal* cases it is twofold: of real and personal estates, as by attainder in high treason; or in petty treason and felony, of all chattel interests absolutely, and the profits of all freehold estates during life and after death, of all lands and tenements in fee simple (but not those in tail) to the crown for a year and a day, &c. Lands are forfeited upon attainder, and not before; goods and chattels are forfeited by conviction. By 33 and 34 Vict. cap. xxiii. it has been enacted that no conviction for treason or felony shall cause attainder or corruption of blood, or any forfeiture or escheat, provided that nothing in this act shall affect the law of forfeiture consequent on outlawry.

FORGE is the name either of the furnace at which wrought iron is hammered and fashioned, called a smith's forge, or of the workshop in which iron is made malleable, also called a shingling-mill. A forge requires a furnace, an anvil, and a bellows, but all

these requisites differ according to the nature of the work to be performed. A common smith's forge is blown with an ordinary bellows wrought with the hand, where the forges are numerous or large more powerful apparatus for blowing them is required. The appliances required for the anvils in modern forging include moulds and machinery of all kinds, for forging articles the most various in size and design. In the forging of heavy work the steam-hammer is freely used, and corresponding moulds and matrices are fixed in the anvil and the hammer. In cutlery and other finer processes of manufacture the most light and delicate work is performed by appropriate machinery placed on the anvil of the forge. Air-furnaces and open fires of various kinds are used in forging according to the nature of the work. See ANVIL, BELLOWS, BLOWING-MACHINE, IRON, &c.

FORGERY, at common law, the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making, *malo animo*, of any written instrument for the purpose of fraud and deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument. Besides the offence of forgery at common law, which is of the degree only of misdemeanour, there are very numerous forgeries specially subjected to punishments by the enactments of a variety of English statutes, which, for the most part, make the forgeries to which they relate capital offences. The offence of forgery may be complete though there be no publication or uttering of the forged instrument; for the very making with a fraudulent intention, and without lawful authority, of any instrument which, at common law or by statute, is the subject of forgery, is of itself a sufficient completion of the offence before publication. Most of the statutes, however, which relate to forgery make the publication of the forged instrument, with knowledge of the fact, a substantive offence. It is said by Hawkins that the notion of forgery does not seem to consist in the counterfeiting of a man's hand and seal, which may often be done innocently, but in endeavouring to give an appearance of truth to a mere deceit and falsity, and either to impose that upon the world as the solemn act of another, which he is in no way privy to, or at least to make a man's own act appear to have been done at a time when it was not done, and, by force of such a falsity, to give it an operation which, in truth and justice, it ought not to have. A deed forged in the name of a person who never had existence is forgery at law, as was determined in Bolland's case. A writing is forged where one, being directed to draw up a will for a sick person, doth insert some legacies therein falsely out of his own head. It is not material whether a forged instrument be drawn in such manner that if it were in truth that which it counterfeits it would be valid. The punishment of forgery at common law is, as for a misdemeanour, by fine, imprisonment, and such other corporeal punishment as the court in its discretion shall award. The punishments ordained for the offence by the statute law in England were once, with scarcely an exception, capital. Capital punishment for forgery was entirely abolished by act 2 and 3 William IV. cap. cxxiii., 1832, and 24 and 25 Vict. cap. xcv., 1861. The law relating to forgery is now regulated by the Criminal Law Consolidation Act, 24 and 25 Vict. cap. xciv. to c., 1861, amended by 33 and 34 Vict. cap. lviii., 9th Aug. 1870. The punishment for forgery varies from penal servitude for life, or not less than five years, to imprisonment for not more than two years.

FORGET-ME-NOT (*Myosotis palustris*, natural order Boraginaceæ) is a small herbaceous plant, common in wet places throughout all Europe and a great part of North America. The root is perennial; the stem about 1 foot high, bearing small blue flowers. The brilliancy of the flowers renders them conspicuous notwithstanding their diminutive size, and it is considered the emblem of friendship among most of the nations of Europe, probably owing to its clear blue, the colour of fidelity.

FORK. Forks are first mentioned in an inventory of a prince's plate in 1379. Before this period the knife only was used for the purpose of cutting up food. The use of the fork spread from Italy to the northern parts of Europe. Thomas Coryate, a traveller who visited Italy in 1608, is said to have introduced it into England. Queen Elizabeth was the first sovereign of England who is known to have had a fork. The use of the fork was considered so great a luxury, that many monastic orders forbade their members to indulge in it. The Asiatics, even to this day, use no forks, as is also the case with the Turks. The Chinese, instead of forks, make use of two small sticks (see CHOPSTICKS), which they hold in the same hand between different fingers.

FORLI, a province of the Kingdom of Italy, bounded N. by the province of Ravenna; W. by Florence; S. by Urbino e Pesaro and the small republic San Marino; and E. the Adriatic; area, 716 square miles. The surface in the west is rather elevated, being partially formed by low branches of the Apennines, but elsewhere becomes flat, particularly in the north towards the coast, where extensive swamps prevail, and make the air very unhealthy. The interior often suffers from excessive drought, and earthquakes are not unfrequent. Much of the soil is well adapted for the growth of corn, hemp, and flax. Madder, saffron, and anise are also cultivated, and much attention is paid to the rearing of bees and silkworms. The vine, olive, and various fruits are extensively cultivated. There is not much land in pasture, and cattle are comparatively few. The fisheries on the coast are productive. The only mineral substance of any consequence is sulphur, of which considerable quantities are obtained. The district is traversed by the railway from Milan to Ancona. Pop. (1871), 233,969.

FORLI (ancient *Forum Lirii*), a town, Italy, capital of the above province, 38 miles south-east of Bologna, on the railway to Ancona, in a pleasant and fertile plain watered by the Ronco and Montone. It is handsome and well built, with a spacious square, and contains many beautiful buildings, including several palaces, one of which, the Palazzo Guerini, is after the designs of Michael Angelo. It also has a cathedral and several other churches, most of which are adorned with fine paintings by Cignani, Guido, and other masters. There are likewise numerous convents in the town. Forli is a bishop's see, and the residence of the legate. It has a college, a public library, and some literary societies; manufactures of silk ribbons, silk twist, oil-cloth, woollen stuffs, wax, nitre, and refined sulphur; and a considerable trade in corn, wines, oil, hemp, and aniseed. Pop. (1871), 38,480.

FORLORN HOPE, a body of men, usually volunteers, selected from different regiments for the assault on a fortress. The corresponding French term, *enfants perdus*, is applied to the body which begins the attack of the day, whether in the field or in an assault on a besieged place.

FORM, PRINTER'S, an assemblage of letters, words, and lines, disposed into pages by the compositor, from which, when inked, impressions are taken.

FORMÂ PAUPERIS (IN). By the laws both of England and Scotland provision is made for suits being carried on by individuals who are too poor to

pay the usual fees. A suit conducted under these provisions is said to be a suit *in formâ pauperis*.

In England, by the statutes 11 Henry VII. cap. xii., and 28 Henry VIII. cap. xv., it is provided that any one taking oath that he is not worth £5 beyond his wearing-apparel and the subject in dispute, is entitled to have writs, according to the nature of the case, without paying fees, and the judges may assign him counsel and attorney who shall act gratuitously. This indulgence is granted to plaintiffs only at common law, and is granted to defendants only in prosecutions. A plaintiff must have a counsel's certificate of a good cause of action, and an affidavit of the party or his attorney must be laid before court that the case contains a full and true statement of material facts. A person admitted to sue in formâ pauperis is not entitled to costs from the opposite party, unless by order of the court or of a judge.

In Scotland similar provision was made for the poor by statute 1424, cap. xlv. The practice is to form a roll of litigants entitled to sue in formâ pauperis, to which applicants are admitted by the court, on being satisfied of their poverty and of their possessing *probabilis causa litigandi*. In Edinburgh the Faculty of Advocates appoint six of their number annually to be advocates for the poor, and the writers to the signet and agents and solicitors respectively appoint four of their number annually to be agents for the poor. A list of these appointments is given in to both divisions of the Court of Session. Agents for the poor are also appointed before the sheriff courts. The applicant for admission to the poor-roll must produce a certificate from the minister and two elders of the parish in which he resides setting forth his circumstances according to a prescribed formula. Ten days' previous notice must be given to the adverse party of the time and place fixed for making the declaration before the minister and elders.

FORMATION, Geological. By this are meant mineral beds or strata, differing essentially from those lying beneath and above, both in their aspect, mineral constituents, and fossil contents, and supposed to have been deposited under the same cosmical conditions, and hence regarded as representing a distinct period in the succession of changes which have passed over the earth's surface. In most of the formations there are some mineral and fossil affinities; and in many, even where the external differences are apparently complete, there are some common characters, by the aid of which a passage from the one to the other can be traced. Thus the chalk differs essentially, both from the green sand which lies beneath it, and the plastic clay which lies above it, in its aspect, its mineral constituents, and many of its fossil contents. Yet the green sand passes into the chalk marl, and this last into the chalk. Their common characters are almost obvious enough to warrant our classing all the beds of chalk and green sand in one formation, did not the cretaceous and flinty characters of the first distinguish it in a marked manner from all the rest.

A *formation* properly means an assemblage of beds, distinct from each other, but lying in a group in a determinate order, the whole having a common character or affinity, and being constantly found in a particular part of the geological series, overlying another formation distinct from itself. The oolitic series is an assemblage of this kind, having a common oolitic character, from the lias to the Portland oolite inclusive, notwithstanding the important deposits of Kimmeridge clay, Oxford clay, &c. &c., which occasionally separate the calcareous beds. The coal formation, also, which is a series of alternate beds of coal, shale, sandstone, and limestone, is illustrative of the nature of a formation. Coal, moreover, is occasionally found in the inferior deposits of the millstone grit, the carboniferous limestone, &c., and under circumstances that warrant our classing them all in one group, as has been done with the oolitic series, from the prevalence of the oolitic character. Coal is only worked profitably in beds above the carboniferous limestone, and hence the term *coal formation* is sometimes, though not with strict propriety, confined to strata in which workable seams of coal usually occur. In the same way, also, we speak of the *coal measures*.

The unvarying succession of formations to each other in the geological series has been found to exist in parts of the earth widely separated from each other, and warrants not only the belief that they have come into their order successively, but that the causes which brought each formation to its place were of one class, and operated simultaneously. When we consider the invariable succession in all the observed parts of our planet, exemplified in the different formations, we cannot but look to a regular succession of causes for the production of these uniform results. And although the order and continuity of the series are much interrupted occasionally, it is less difficult to believe that particular circumstances have interrupted such succession and continuity than that they have not existed. See Geology.

FORMENTERA. See Baleares.

FORMICA. See Ant.

FORMIC ACID ($C H_2O_2$). When an ant (*Formica rufa*) is allowed to run over a piece of blue litmus paper it leaves a red track, showing that an acid fluid is secreted by it. If a quantity of the insects be pressed and distilled with water a mixed oily and aqueous fluid, with a very acid reaction, comes over. By neutralizing with potassic or sodic carbonate, heating to remove the oil and water, and then decomposing the residue with sulphuric acid, the acid of the ants—hence called formic acid—may be distilled off. It was first obtained by John Wray, who, in his account of it in 1670, compares it with acetic acid, and mentions its compounds with lead and iron. Afterwards it was frequently examined by the chemists of last century, by Marggraf, Homberg, and Scheele, and especially among modern chemists by Berzelius and Liebig, and its preparation by a great variety of reactions, from a multitude of substances, has been described. When its simple composition is considered it is not difficult to see how it should result from a number of decompositions, because it is one of the last stages in the oxidation of organic substances, as it only wants an additional proportion of oxygen to be converted into carbonic anhydride and water.

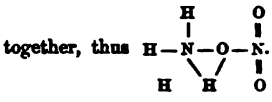
Formic acid exists not only in ants but in the blood, urine, and flesh-juice of animals; in the stinging-nettle, in fir-tree needles, tamarinds, and in some mineral waters. It is, however, usually prepared by the oxidation of organic matter, such as sugar, starch, woody fibre, alcohol, tartaric, oxalic, and other acids, by means of sulphuric, nitric, chromic, or permanganic acid, by a mixture of oxide of manganese and sulphuric acid, of lime and bleaching-powder, and by many other processes. One of the best consists in heating oxalic acid and glycerin. So long as it was obtained merely from the substances mentioned it was naturally supposed to be either itself a product of life, or to be derivable from substances similarly produced. This, however, is now known to be inaccurate, for formic acid can be obtained synthetically by a variety of reactions. The most direct consists in keeping carbonic oxide gas (C O) in contact with aqueous or alcoholic potash. The gas is gradually absorbed, and potassic formate ($KCHO_2$) is the result. On distilling this salt with dilute sulphuric acid the acid is

separated. Pure formic acid, at ordinary temperatures, is a colourless, transparent, fuming fluid, caustic and pungent, of sp. gr. 1·235, which boils about 212° Fahr., evolving an inflammable vapour. Below 32° Fahr. it solidifies to shining plates. It mixes with water and with alcohol in all proportions; the solution has a pungent odour and sour taste, and strong acid reaction. It is decomposed by a number of reagents, such as sulphuric acid or nitric acid, or chlorine, with evolution of carbonic oxide or carbonic acid gas. Formic acid is the lowest member of the series of *fatty acids* (which see); it is monobasic, but it forms both acid and double salts. It combines with the metals, and reacts with the metallic oxides or carbonates to form the large class of salts called *formates;* but in certain cases, for instance with salts of silver, platinum, or mercury, it acts the part of a reducing agent, and throws down the elements in the metallic state. In this way it is distinguished from acetic acid. The formates, as a rule, crystallize well, and are all soluble in water. On heating they are decomposed into carbonate or oxide, or even reduced to the metallic state, combustible gas at the same time being evolved. It also forms a series of compound ethers (see ETHER) or ethereal salts, by combining with methyl, ethyl, amyl, and other alcohol radicles; the ethylic formate was known last century, and was got by mixing spirit and formic acid and distilling away the ether which formed. The acid and its compounds are not employed in the arts.

FORMOSA, an island in the Chinese Sea, separated from Fo-kien, China, in which province it is included, by a strait about 80 miles wide where narrowest. The island is about 250 miles in length and 70 in breadth, but narrowing greatly towards the extremities. Its area is estimated at 15,000 square miles. That part of Formosa which the Chinese possess presents extensive and fertile plains, watered by a great number of rivulets, that fall from the eastern mountains. Its air is pure and wholesome, and the soil produces in abundance corn, rice, and most other kinds of grain. Most of the Indian fruits are found here, such as oranges, bananas, pine-apples, guavas, cocoa-nuts, and part of those of Europe, particularly peaches, apricots, figs, grapes, chestnuts, pomegranates, water melons, &c. Tobacco, sugar, pepper, camphor, and cinnamon are also common. The capital of Formosa is Tai-ouan—a name which the Chinese give to the whole island. See FO-KIEN.

FORMOSA, an island in the Atlantic, forming one of the Bissago group, which lies between 10° and 11°40′ N. lat., and 15° and 17° W. lon., off the west coast of Africa. It is about 30 miles long and 18 wide. The soil is fertile, and well covered with trees, but wants springs of good water.

FORMULA, in chemistry, is a collection of symbols expressing the composition of a compound. The device appears to have been first employed by T. Thomson to express the composition of minerals, but it was further developed by Berzelius after it was put beyond a doubt that a chemical compound always contains the same elements combined in definite proportion. Formulæ are of various kinds, according to the ideas they are meant to express. Suppose a body has been analyzed and found to consist, say, of 35% of nitrogen, of 5 of hydrogen, and 60 of oxygen; it is next calculated what amount of the combining proportions of each of the elements is represented by these numbers, and this is found to be two combining proportions of nitrogen, four of hydrogen, and three of oxygen, or in symbols $N_2H_4O_3$. Such a formula, expressing merely the proportional composition, is called an *empirical* formula. The study of the properties of this body, the way in which it can be formed, its behaviour when heated, or acted on with acids or alkalies, or in other ways, leads to the conclusion that it is a compound of ammonia and nitric acid, and hence the symbols are usually arranged to denote this, its formula being accordingly NH_4NO_3 or NH_3HNO_3. Such a formula is called *rational*, because it denotes the proximate composition of the body. It so happens, however, that this substance can undergo decomposition in a way which would never indicate that ammonia or nitric acid could be got from it, for, when heated, it breaks up into water and nitrous oxide, and there might be therefore used a rational formula for this view of its composition, such as $N_2O,2H_2O$. The rational formula, in short, may vary with the decompositions of the substance, though practically one formula is adhered to for each substance. The varieties of rational formulæ are much greater in organic than in inorganic chemistry, partly because the proximate decompositions are more numerous in the former than in the latter, and partly because there is less unanimity among chemists as to the classification of organic substances. The most recent formulæ, based on gaseous volume and atomicity, attempt not merely to exhibit one or more reactions or decompositions of the body, but how the 'atoms'—that is, the combining proportion units—are actually combined with each other. Thus the ammonic nitrate already given is written $NO_3(NH_4O)$. This is called a *constitutional* formula. A *graphic* formula is a mere expansion of this to show by a picture how the elements are joined together, thus



Sometimes, instead of letters, diagrams have been used. Besides the above there are *typical* formulæ, representing the constitution of bodies upon the assumption that certain simple bodies—hydrochloric acid, water, ammonia, marsh-gas—are types after which other bodies are constructed. Thus acetic acid, on the water-type, has the rational formula $\left.\begin{matrix}C_2H_3O\\H\end{matrix}\right\}O$. Molecular formulæ are those which represent the amount of a substance which, in the state of vapour, would normally occupy the space filled by two combining proportions of hydrogen at a given temperature and pressure. Thus ferric chloride has the molecular formula Fe_2Cl_6, whereas the empirical formula, which expresses merely the simplest results of an analysis, is $FeCl_3$. The determination of the molecular formula of a substance is of the greatest importance, because from it all its decomposition and other formulæ are deduced; it is, however, sometimes of great difficulty, as it is settled not merely by one or two reactions but by a consideration of all the properties of the substance.

FORNICATION, which is defined as the act of incontinency in single persons, was formerly a punishable offence by the laws of England and Scotland. During the Commonwealth the law was carried to an impracticable degree of severity. After the Restoration the offence was left to be dealt with by the spiritual court according to the canon law, and proceedings against it have fallen into desuetude. In Scotland also the law has fallen into desuetude.

FORRES, the name of a parliamentary burgh of Scotland, in the county of Elgin, 25 miles N.E. Inverness, beautifully situated on a dry sandy knoll. Forres is a clean, well-paved little town, and contains some good buildings, among which may be mentioned the town-house, and Anderson's Academical Institution. Shakspeare has immortalized Forres by making it the scene of the chief events in his tragedy

of Macbeth. The site of the old castle where Duncan was killed is at the western side of the town, and the heath which surrounds it is still 'blasted,' being one of the most sterile moors in Scotland. Close by the town is a remarkable obelisk 23 feet high, 3 feet 10 inches broad, and 1 foot 3 inches thick, called Sweno's Stone, and supposed to commemorate a victory over the Danes. Forres is one of the Inverness district of parliamentary burghs. Pop. in 1871, 3959.

FORSKAL, PETER, a Swedish botanist, and pupil of Linnæus, was born in 1736, and studied at Göttingen, where he defended, in 1756, a thesis—Dubia de Principiis Philosophiæ recentioris. A French pamphlet (Thoughts on Civil Liberty), which he published soon after his return to Sweden, offended the ruling oligarchy in that country. In 1761 he was appointed professor of natural history in Copenhagen, and the same year, on the recommendation of Linnæus, he was selected by Frederick V. to join the scientific expedition to Arabia, to take charge of the department of natural history. He set out on this expedition with Niebuhr, Von Haven, and Kramer, and collected plants in the environs of Marseilles, of which he published a Flora at Malta. He arrived in Egypt and Arabia, where he collected plants with the greatest zeal; but being attacked by the plague, he died in 1763 at Djerim, in the latter country, too early for science. Niebuhr collected Forskal's papers, which consisted merely of detached sheets, accompanied them with remarks, and published them under the titles Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum, quæ in Itinere Orientali observavit P. Forskal (Copenhagen, 1775, with an engraving); Flora Ægyptiaco-Arabica, &c. (ibid.); Icones Rerum Naturalium, quas in Itinere Orientali depingi curavit Forskal (ibid. 1776, with forty-six engravings, of which twenty represent plants and twenty-three animals). The drawings are by Brauernfeind, the painter of the expedition, who likewise died in the East. Linnæus called an exotic plant *Forskalea*, in honour of his pupil.

FORSTER, JOHANN GEORG ADAM, was born in 1754, at Nassenhuben, near Dantzig. He accompanied his father at the age of eleven years to Saratov, and continued in St. Petersburg the studies which he had begun under his father's direction. When his father went to England he was placed with a merchant in London; but his feeble health soon compelled him to give up mercantile pursuits, and he resided with his father at Warrington, where he continued his studies, translated several works into English, and taught German and French in a school of the neighbourhood. In company with his father he performed the voyage round the world with Cook, 1772–75. In 1777 he went to Paris with the intention of settling there, but soon after went to Holland, and was on his way to Berlin when the landgrave of Hesse offered him the chair of natural history in an academy in Cassel. He held that office till 1784, when he accepted an invitation to become professor of natural history at Wilna. Here he received the degree of Doctor of Medicine. The Empress Catharine, in 1787, formed the design of a voyage round the world, and Forster was named historiographer of the expedition. The war with Turkey interrupted the project, and Forster, unwilling to remain idle, returned to Germany, and published several treatises on natural history and literary subjects. In 1788 the elector of Mainz appointed him his first librarian. Forster occupied this post with great reputation, till the French entered the city in 1792. He had warmly embraced revolutionary principles, and was sent to Paris, by the republicans of Mainz, to request a union with France. While absent on this commission the Prussians recovered the city. By this event he lost all his property, with his books and papers. He thus found himself completely ruined. His own country had now almost ceased to have any attractions for him, and he adopted the resolution of going to India. With this view he began the study of the oriental languages, but being completely prostrated by the repeated shocks of misfortune, died at Paris in 1794. Forster is considered by the Germans one of their classical writers. His translations are numerous. The excellent account of Cook's second voyage round the world he wrote in connection with his father. He also wrote Essays on Geography, Natural History, Practical Philosophy, six vols., and excellent Views of the Lower Rhine, Brabant, Flanders, Holland, England, and France, in 1790, three volumes. He has also the merit of having transplanted into the German soil the celebrated Indian drama, the Sacuntala of Kalidasa.

FORSTER, JOHANN REINHOLD, professor of natural history at Halle, in Prussia, was born at Dirschau, October 22, 1729. His family, which was descended from an ancient house in Scotland, had fled to Polish Prussia. His father was burgomaster of Dirschau, a town not far from Dantzig. Reinhold became thoroughly grounded in the languages, chronology, and geography at Berlin. In 1748 he began to study theology at Halle; and in 1751 he went to Dantzig and obtained the place of preacher at Nassenhuben or Nassenhof. He gave just so much attention to his office as necessity required, and entered with his whole soul into his favourite studies—mathematics, philosophy, history, geography, and the ancient languages. His passion for travelling was gratified by a commission to examine the state of the colony of Saratov, in Asiatic Russia, for which he set out in March, 1765. His official report gave much satisfaction; and after his return to St. Petersburg he was commissioned, with several other distinguished men, by the Empress Catharine II., to draw up a code of laws for the colonists. But his activity was not rewarded as he had expected; and having lost the place of preacher by his long absence, he went to London in August, 1766, without having received the least compensation. Here he supported himself and his son Georg partly by the sale of the curiosities which he had collected in his travels, and partly by translations. He afterwards joined a Dissenting academy at Warrington, in Lancashire, as teacher of natural history and the French and German languages. He was finally invited to accompany Captain Cook in his second voyage of discovery as naturalist of the expedition. He set out from London, June 26, 1772, with his son, at that time seventeen years old. This voyage, which lasted three years, is minutely described in a work bearing the name of his son Johann Georg Forster (London, 1777, two vols. 4to), as it was made a condition with the father that he should not print any account of this voyage. The father afterwards published his valuable remarks on the physical geography, the natural history, and the moral and intellectual condition of the countries he had visited (London, 1778, 4to). The publication of the account of the voyage gave offence to the British government, and deprived Forster of the chance of further patronage from that quarter; and he remained for some time in straitened circumstances. In 1780 he was invited to Halle, as professor of natural history, and continued an ornament of the university until his death, eighteen years afterwards. At Halle he wrote many valuable works, and translated the latest voyages, among which was the third voyage of Cook. He died

December 9, 1798. He united great penetration and quick apprehension with an astonishing memory. He spoke or wrote seventeen living and dead languages, and was well acquainted with every department of literature. In history, botany, and zoology, he stands, with his son, among the first investigators of the last century. Of his numerous writings, the best are his Observations on a Voyage round the World, already mentioned, his History of Voyages and Discoveries in the North, and his Antiquarian Researches on the Byssus of the Ancients.

FORT, a small fortified place surrounded with a ditch, rampart, and parapet, for the purpose of defending a pass, river, road, harbour, &c. Forts are made of different forms and extent according to the exigencies of the case.

FORT-AUGUSTUS, a fortress, Scotland, county of, and 30 miles south-west of Inverness, at the south-west extremity of Loch Ness. It stands on the edge of the lake, and was built, in 1730, for the purpose of overawing some of the Highland clans. It is of a square form, with four bastions at the corners defended by a ditch, covered way, and glacis. It was taken by the Highlanders in 1745. It is now occupied by a few old soldiers only, the guns having been removed to Fort-George. — The village of same name, close upon the banks of the Caledonian Canal, outside the fortress, is straggling and insignificant, but has a respectable church and two fairs.

FORT DE FRANCE, or Fort-Royal, a town and seaport, French West Indies, island of Martinique, of which it is the capital; situated on the north side of a deep and well sheltered bay protected by a fort, which covers the whole surface of a peninsula, and commands the town and harbour. The streets are straight and spacious; houses, in general, well built. The principal buildings are the parish church, government offices, the barracks, arsenal, prison, and hospital. At its eastern extremity, near the careening place, is a fine parade called the Savannah, forming the glacis of Fort St. Louis. From its situation on the west side of the island the bay is protected from the prevalent winds, and in one part or another will be found suitable for all circumstances. In 1839 Fort-Royal was almost wholly destroyed by an earthquake. Fort-Royal is the residence of the French governor. Pop. 11,424.

FORT-GEORGE, a fortress, Scotland, county of and 10 miles north-east of Inverness, at the extremity of a low point of land projecting into the Moray Firth. It is an irregular polygon, with six bastions, and has accommodation for 2090 men besides officers. It was built after the rebellion of 1745, for the purpose of keeping the Highlanders in subjection. It occupies 15 acres, but, though skilfully constructed, is secure from attacks by sea only, being commanded by some adjoining heights.

FORTH, a large river of Scotland, reckoned the third Scotch river in point of magnitude, is formed by the junction of two head streams, called respectively the Duchray and the Dhu: the one rising in Stirlingshire, the other in Perthshire, at the distance of a few miles from each other, and both on the north-east side of the mountain Ben Lomond. The junction of these streams takes place at Aberfoyle, from which the river flows south-east, and discharges itself into the German Ocean, having previously expanded into a broad estuary called the Firth of Forth. It forms, for a considerable part of its course, the boundary between the counties of Stirling and Perth. For the greater part of its course it flows through a rich, flat country, and is navigable for vessels of 300 tons as far as Alloa, and for those of 70 tons to Stirling. Its most remarkable windings, called the Links of Forth, occur between the latter places, the distance between Stirling Bridge and Alloa being but 6 miles by land, while by water it is 12. These windings form a great number of beautiful peninsulas. For several miles above and below Clackmannan the tides of the Forth exhibit a singular phenomenon, called by seamen 'leaky tides.' When the water has flowed for three hours it runs back for about an hour and a half, nearly as far as when it began to flow. It returns immediately and flows during another hour and a half to the same height it was before; and this change takes place both in the flood and ebb tides. There are thus actually double the number of tides in this river that are to be found anywhere else. The Firth of Forth contains great variety and considerable abundance of fish, particularly herrings, which frequent it in immense shoals. Oysters also abound in the estuary. The principal tributary rivers of the Forth are the Teith and Allan, above Stirling Bridge, and below it the Devon, Carron, Avon, Almond, Leith, Esk, and Leven; these chiefly flow into it on the south shore. There are several islands in the river. Lighthouses are erected on two of them, the Isle of May and Inchkeith; and the ruins of castles or religious houses appear on all the different islands. There are also numerous ports, the most important of which are in the Firth. The course of the Forth, including its windings, is estimated at 170 miles.

FORTIFICATION, the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked. The nature of the works is different, according to the objects for which they are intended and the engines by which the attack will probably be made. Against an enemy without artillery a simple wall would be sufficient, which a single battery might soon demolish. The first species of fortification was, of course, very simple, consisting merely of an earthen mound or of a fence of palisades. With the increase and improvement of engines of attack the defensive works were likewise made stronger, and constructed with more art. A ditch was added to the wall; round or square towers were then introduced, placed at such intervals as to be capable of affording assistance to one another. This was the whole art of fortification practised by the ancients. Vegetius describes it in a few words: The ancients, he says, found that a wall ought not to be constructed in a straight line, because a breach could easily be made by the battering-ram; but the towers which they built at short distances from each other formed a broken line, with salient and re-entering parts. If the enemy attempted to employ his scaling ladders, he exposed himself to missiles on all sides, even from his rear. With the introduction of artillery in sieges the art of fortification underwent a great change. The first modification was an increase in the thickness of the walls, and in the diameter of the towers, at the expense of their height. These towers were now called roundels, and made large enough to accommodate several pieces of cannon. To enable the besieged to work cannon on the wall a rampart of earth was thrown up behind it so as to give the necessary width; and this earthwork gradually encroached on the wall, in some cases entirely superseding it. This system was developed by Albrecht Dürer, the painter, who may be said to form the connecting link between the ancient and modern styles. It was soon found, however, that the round shape of the tower had the serious disadvantage that neither the curtain (the portion of wall between two towers) nor the next adjoining towers could reach with their fire every point in front of an intermediate tower; there were small angles close

to the wall where the assailants would be in complete shelter. To obviate this the tower was changed into an irregular pentagon, with four sides towards the open and one towards the interior. This pentagon was called a bastion. The time of the invention of bastions is not precisely ascertained. It is certain, however, that they were in use in 1500. Some ascribe this important invention to Ziska, the celebrated leader of the Hussites. He fortified Mount Tabor with bastions. Folard is of opinion that Achmet-Pacha constructed bastions at Otranto in 1480. According to others the Veronese San-Micheli was the inventor of them. In Germany, Daniel Speckle, an engineer of Strasburg (who died in 1589), wrote a work on fortifications, in which he calls himself the first German who had written on triangular bastions. The Italians and French have carried the art to great perfection. Fortifications are divided into regular and irregular, permanent and temporary. In regular fortifications the bastions are all equal, and form regular figures, mostly equiangular and equilateral polygons. In irregular fortifications only the corresponding sides and angles are equal. These are most common, as the inequalities in the ground seldom admit of regular fortification. The regular fortifications are, however, much to be preferred, as they offer equal resistance on all sides, and expose no weak points of which the enemy can take advantage. The construction of irregular fortifications is often rendered difficult by the character of the ground and the diversity of the works. In spite of the greatest exertions to make every point equally strong, the most skilful engineer often fails. The first fortresses of Europe prove this. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, &c. Temporary fortifications are such as are designed merely to throw momentary obstacles in the way of the enemy, as field-works, &c. To prevent obscurity we proceed at once to give the description and nomenclature of bastionary defence, based on one of those systems which shows all its essential particulars. In Pl. LXVIII. LXIX. is given a vertical section of a regular fortification; the place to be defended being supposed to be the left or rear. The mass of earth *e g a c h* forms the rampart with its parapet; the banquette *g* is a step raised to enable the defenders to fire over the parapet, which should be about 8 feet high; *h* is the escarp or scarp, generally faced with masonry, *i* the counterscarp. The ravelin redoubt is constructed in the same way as to rampart and parapet, but is lower than the bastion. The covered way, immediately behind and covered from the enemy's fire by the glacis, is also furnished with a banquette. The glacis is sloped so as to bring the assailants into the line of fire from the parapet of the bastion to that of the covered way. Fig. 1 is a plan of one front of a fortress. A is the bastion, B the curtain protected by the ravelin F, with its redoubt or place of retreat G. The elevated work I called a cavalier is mounted with guns which command the ravelin, and the tenaille C is a low work designed to prevent the curtain and flanks of the bastion from being breached. Sometimes there is a small work constructed to cover the communication across the ditch from the tenaille to the ravelin. The covered way is protected by traverses, or short parapets thrown across it, which screens the defenders from the enfilading fire of the enemy. It will readily be observed from the diagram that the guns on the flanks of the bastions sweep the whole ditch in front of the adjoining bastions, while, on the other hand, the inner faces of two adjoining bastions cover the faces of the ravelin between them, by keeping the ditch in front of the ravelin under their fire. There is thus no part of the ditch left unprotected by a flanking fire; in this consists the great step in advance by which the bastioned system inaugurated a new epoch in the history of fortification. The systems of bastionary fortification are classed under several national schools, the first in point of date being the Italian. The first Italian bastions were little else than polygonal towers or roundels; they scarcely altered the former character of the fortification, except as regards the flanking fire. The enceinte or main wall was still of masonry, exposed to the direct fire of the enemy, the rampart of earth behind it served chiefly to give room to handle the artillery, and its inner slope was also faced with masonry. The curtains were very long, from 300 to 500 yards, and the bastions very small, the flanks always perpendicular to the curtains, and meant to cover the long line of curtain alone. Sometimes a platform or flat obtuse-angled bastion was constructed in the middle of the curtain when it became too long. There were, as yet, no ravelins, no tenailles, no covered way, no glacis. But the system was soon improved. The curtains were shortened, the bastions were enlarged. The ditch was made very wide and deep, and the covered way was introduced. It served as a place of concentration as well as retreat for sallying parties. The gates were in the middle of the curtain; to cover them a crescent-shaped work was placed in the middle of the ditch in front of them; but for the same reason that the towers were transformed into bastions, the half-moon (demi-lune) was changed into a triangular work—the present ravelin. This was at first small, but soon became larger, when it was found that it not only served as a bridge-head across the ditch, but also covered flanks and curtains against the enemy's fire, gave a cross fire in front of the capital (most advanced angle) of the bastions, and effectually flanked the covered way. The first to point out the defects in the Italian system was a German engineer named Franz, who fortified Antwerp for Charles V. He was followed by Daniel Speckle, who broke completely through the fetters of the old school, and laid down the principles on which the whole of the subsequent systems are founded. His practical skill was shown in the construction of the fortresses of Ingolstadt, Hagenau, Ulm, Colmar, Basle, and Strasburg. The great engineer Vauban, who served under Louis XIV., may be said to have made the French school the first in Europe. Not that there was anything original in his system, as he borrowed his best ideas from Speckle, and a countryman of his own named Pagan. But the arrangement of the details, the proportions of the lines, the profile, and the adaptation of the theory to the ever-varying requirements of the locality, are so ingenious that they appear perfection when compared with the works of his predecessors, so that scientific and systematic fortification may be said to commence with him. His great rival, Coehorn, skilfully developed the system of the old Dutch school with its low ramparts, without masonry revetments, broad and shallow water ditches, numerous outworks in the ditch, and the plan of laying the country outside the glacis under water. The modern system of protecting large fortresses may be said to be due to the genius of Montalembert (1713–99), a French major-general. It consists of surrounding the place by a single or double chain of small forts on commanding elevations, which, though apparently isolated, still support each other by their fire, and by the facility which they give for powerful sorties render a bombardment of the place almost impossible, and when required form an entrenched camp for an army. The largest fortress constructed on this

system is Paris; it has a simple bastioned enceinte, with bastioned forts almost all squares; there is no outwork, not even a ravelin in the whole fortification. The superiority of the modern system of defence, as against modern means of attack, was fully demonstrated in the Franco-German war; yet the capture of Paris by the Germans in the beginning of 1871 forms a striking illustration of the rule, that the reduction of a fortress is simply a question of time.

Field Fortification.—The construction of field works is as ancient as the existence of armies. The Roman legions in presence of an enemy entrenched their camp every night. During the seventeenth and eighteenth centuries field-works played an important part in several campaigns, and in the wars of Frederick the Great pickets on outpost duty generally threw up slightly profiled redans. Yet even then, and it is still more the case now, the construction of field-works was confined to the strengthening of a few positions selected beforehand, with a view to certain eventualities during a campaign, such as Frederick's camp at Bunzelwitz, and Wellington's lines at Torres Vedras. Formerly entrenched lines were continuous; but from the defect that if taken at one point the whole line was useless, they now universally consist of one or more lines of detached redoubts, flanking each other by their fire, and allowing the army to fall on the enemy through the intervals as soon as the fire of the redoubts has decreased the energy of his assault. This is the principal function of field-works, but they are also employed singly to defend the access to a bridge or to close an important pass. The more important works of this nature are the redan, which consists of two parapets, with a ditch in front, forming an angle facing the enemy; or lunettes, which are redans with short flanks. The chief closed field-work now in use is the redoubt, either as a regular or irregular quadrangle, closed by a ditch and parapet all round. The parapet is made as high as in permanent fortification, but not so thick. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within musket range. To do this effectually, and to strengthen the whole line, the plan generally adopted is to form an entrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts.

FORTIGUERRA, Niccoli, born at Pistoia, 1674; a prelate at the court of Pope Clement XI.; one of the best Italian poets in the first half of the eighteenth century, uniting the peculiarities of Ariosto, Berni, and Tassoni. In his epic poem Ricciardetto, so called from one of the Paladins of Charlemagne, he wished to show that it was easy to imitate Ariosto. He wrote the first canto of this poem in one night, and at the request of his friends continued the work. It extended to thirty cantos. He would not permit it to be printed before his death (February 17, 1735). It appeared (1738, in two vols. 8vo) under the name of Carteromaco, which had been assumed by the author during his life. The invention appears almost entirely his own. He treats history so arbitrarily that he makes his hero ascend the imperial throne after the death of Charlemagne. Symmetrical unity is not a characteristic of this work. Its principal excellence consists in the description of situations. He breaks off the thread of his narration according to his humour, and resumes it again as capriciously as Ariosto. But his descriptions are more comic than those of Ariosto, and more satirical than those of Berni and Tassoni. His satire on the corruptions of the clergy is very keen, and was probably the reason that he was so unwilling to have the poem published. His short poems and sonnets are be found in different collections of Italian poets.

FORTRESS. See Fortification.

FORTROSE, a seaport, royal and parliamentary burgh, Scotland, in the county of Ross, occupying a romantic situation on the north shore of the Moray Firth, 8 miles north-east of Inverness, nearly opposite Fort-George, with which there is communication by a ferry. It was formerly called Chanonry, from being the chanonry of Ross, where the bishop had his residence. It was united to the burgh of Rosemarkie, which is about 1 mile north-east from it, by a charter granted by King James II., anno 1444, under the common name of Fortross, now Fortrose. The town is spoken of as having been then a seat of the arts and sciences. Of its ancient cathedral, which stood in a spacious square, only a few colonnades and arches now remain. These, however, from their tasteful execution, afford evidence of its having been a splendid edifice. Though possessed of a good harbour and other advantages, the town has no trade. It unites with Inverness, Nairn, and Forres, in returning a member to the House of Commons. Pop. 914.

FORT-ROYAL. See Fort de France.

FORTUNA, called by the Greeks *Tychē*, the goddess of success. According to Hesiod she was a daughter of Oceanus; according to Pindar, a sister of the Fates. She had temples at Corinth, Elis, and Smyrna, was worshipped in Italy before the building of Rome, and had a celebrated temple at Antium, in which were two statues, which were consulted as oracles, and gave responses either by signs or by lot. She had also a temple at Præneste, whence she was called *Dea Prænestina*. No less than twenty-six temples were erected to her at Rome, the first of which was built by Servius Tullius. She is generally delineated with two rudders, with one of which she guides the ship of prosperity, with the other that of misfortune. At a later period she was represented with a bandage over her eyes and a sceptre in her hand, and sitting or standing on a wheel or globe. She is usually dressed as a matron. Different symbols of Fortuna are found in different gems; for example, a circle drawn over a globe, a globe between a rudder and an ear of corn, and having a wheel standing on it. On a coin of the Emperor Geta she is represented sitting on the earth with her bosom bare, her right hand resting on a wheel, and holding in her left hand, resting on her lap, a horn of plenty. Her rudder is supported sometimes on a globe, at others on a wheel, and at others on the beak of a ship. She was often represented with wings, but never so by the Romans; for they said that, having flown over the whole earth without resting anywhere, she at length alighted on the Palatine Mount, laid aside her wings and shoes, and descended from her globe to remain for ever in Rome.

FORTUNA, a town, Spain, province and 11 miles north by east of Murcia, with three squares and several regular and tolerably well-built streets. In the vicinity are chalybeate thermal springs, which were once famous. Pop. 5600.

FORTUNATE ISLANDS. See Canaries.

FORTUNE-TELLERS. By 5 Geo. IV. cap. lxxxiii. sec. 2, persons professing or pretending to tell fortunes are punishable as rogues and vagabonds. By an act passed in Scotland in 1579 the punishment for this offence is scourging and burning on the ear.

FORT WAYNE, a flourishing city, capital of Allen county, Indiana, United States, situated in a beautiful and well-cultivated country at the junction of the St. Mary's and St. Joseph's rivers, which here unite to form the Maumee. It derives its name from a fort erected here in 1794 by General Wayne.

The town has grown up with great rapidity, and is now one of the most important places in the state. It is the seat of a Roman Catholic episcopal see, contains fifteen churches, and supports several newspapers. Pop. 17,718.

FORUM, among the Romans, any open place where the markets and courts of justice were held. The *Forum Romanum* in Rome was a splendid place, which served for a public walk, and was called, on account of its size, *forum magnum*. As the population of Rome increased various spots were selected for the markets and the courts of justice. The number of these places was finally increased to seventeen. The great Roman forum, which was bounded on the south by Mount Palatine, and on the north-west by the Capitoline Hill, and which was called *the forum* by way of eminence, was destined by Romulus for the assemblies of the people. Tarquinius Priscus surrounded it with porticoes, by which means the people were protected against the weather. In these buildings stagings were raised, from which the plays represented in the market-place were seen before the erection of theatres. The forum was afterwards adorned with such an immense number of statues, taken thither from Greece, that it became necessary to remove many of them. The gilt statues of the twelve great gods were particularly remarkable. This place, once adorned with the most beautiful palaces and the most splendid buildings, is now called *campo vaccino* (field of cattle), and is almost a waste, but is covered with numerous relics of its former majesty.—In the law *forum* signifies a court of justice, the place where disputed rights are settled; hence *forum competens*, a competent jurisdiction, under which the cause regularly falls. *Forum incompetens*, on the contrary, is a court not authorized to try the case. *Forum contractus* is the jurisdiction of the place where the contract is made; *forum delicti* (*commissi*) is the jurisdiction of the place where the crime is committed; *forum domicilii* and *forum habitationis* (see DOMICILE); *forum apprehensionis*, where the criminal is seized; *forum originis*, where the person is born; *forum rei sitæ* is the jurisdiction of the place where the thing in dispute is situated; *forum privilegiatum* is a tribunal under the jurisdiction of which any one comes on account of his personal or official character. The clergy, for example (in some countries), have a *forum privilegiatum*, as they do not come under the jurisdiction of common courts, but under that of a *consistorium*. In the same manner students in the German universities are under the jurisdiction of an academical court.

FOSCARI, FRANCESCO, Doge of Venice, born about 1372, elected in 1423. The whole period in which he governed the republic was one of war and tumult. His first war was against the Turks, in which he was successful. He then engaged in hostilities with Filippo Visconti, duke of Milan, and subjected to the republic the territories of Bergamo, Brescia, and Cremona, making the Adda the boundary of the Venetian dominion. Another war, in which nearly all the cities of Italy took part, was brought to an end by the Treaty of Cavriano, by which Venice acquired Lonato, Velaggio, and Peschiera. In 1443 the doge formed a league with Sforza, the duke of Milan, and the Republics of Genoa, Bologna, and Florence, against Alfonso, king of Naples, who was supported by the pope. The Papal excommunication did not prevent Sforza from bringing his opponents to terms by two splendid victories. Three of the doge's sons had died in the service of the republic, and now at the end of his career Jacopo, the only surviving son, was doomed to submit to a much harder fate. He was accused of having received presents or bribes from several foreign princes, and was condemned to torture and exile in Crete. Some time after, prompted by a strong desire to see his country again at whatever peril, he returned, was seized, condemned again, and had scarcely reached his place of exile when he died. At the instigation of a rival, Jacopo Loredano, Foscari was deprived of his dogeship, which he had on two previous occasions wished to resign. The broken-hearted old man expired, it is said, when he heard the bells of St. Mark's announce the accession of his successor. On the story of Jacopo Foscari is founded Byron's tragedy of the Two Foscari.

FOSCOLO, UGO, an Italian poet and prose writer, was born on board a Venetian frigate near the island of Zante, about 1776, and educated at the University of Padua. He made his appearance as a dramatic poet at Venice, a year before the fall of that republic, with his Thyestes, in which he endeavoured to preserve the simplicity and strictness of Alfieri and the Greeks. The wild applause of the public could not blind the young poet to the defects of his piece; he was himself his severest critic. At the time of the overthrow of the ancient aristocracy of Venice, and the establishment of a democracy, Foscolo showed himself an ardent advocate of the new principles. But his prospects of advancement in the new republic were cut off by the cession of Venice to Austria. To divert his mind he wrote a romance, remarkable for vehemence of passion and feeling, under the title Ultime Lettere di Jacopo Ortis (Milan, 1802). An imitation of Goethe's Werther is observable in this work, but it is the political matter interwoven in it, and a sort of melancholy patriotism about the work, which made it so generally attractive to the Italians. The style is excellent. Foscolo then went to Milan, where his friend General Pino procured him a military commission. In 1803 he wrote a satire on some learned men, under the form of a commentary on the Hair of Berenice (la Chioma di Berenice), a poem of Callimachus, translated by Catullus. When some of the French troops were returning to France, Foscolo took this opportunity to go to Paris. After his return, 1807, he published the small poem Dei Sepolcri, in which he handled the Milanese severely. The critics justly found fault with his verse as rough and unmusical, and he determined therefore to try another path. He undertook an edition of the works of Montecuculi from the original manuscripts. This important undertaking was not accomplished entirely to the satisfaction of competent judges, who accused him of ignorance of the fundamental principles of the art of war, and of too great freedom in supplying defective passages in the manuscripts. When Monti, of whom he had been a friend and defender, was on the point of publishing a translation of the Iliad, Foscolo produced a translation of the first book, accompanied with remarks evidently directed against Monti. This produced a coolness between the two friends; and Foscolo was thought to have written his two tragedies, Ricciarda and Ajace, with the same view. But the government, who found other feelings in these pieces, ordered him to leave Milan. To save appearances his friend Pino sent him, with a pretended commission, to Mantua. About this time he published his translation of Sterne's Sentimental Journey. At Mantua he lived until the abdication of Napoleon. He advocated with great warmth the independence of Italy. When Murat began the war he became so obnoxious to the Austrians that he found it necessary to leave Italy. He retired to Switzerland, then to Russia. In 1815 he went to London, where his reputation secured him a favourable reception from the most distinguished *literati* of the country. He contributed

many articles to the English periodicals, among which were two on Dante, in the twenty-ninth and thirtieth volumes of the Edinburgh Review. His Essays on Petrarch (London, 1821), and his Discorso sul Testo di Dante (1826), are valuable criticisms. He left dissertations and notes on the Divina Commedia, which have since been published. He was rather prodigal in his habits, and the last years of his life were passed in comparative poverty. He died, Sept. 10, 1827, at Turnham Green, near London.

FOSS (from the Latin *fossa*, French, *fosse*, a ditch), in fortification, a trench, commonly full of water, lying between the scarp and counterscarp, below the rampart, and turning round a fortified place, or a post that is to be defended.

FOSSANO, a town in North Italy, on the left bank of the Stura, on an elevated plain 13 miles north-east of Cuneo. It is surrounded by old walls, and defended by a castle, and has wide and regular streets lined with arcades, several squares, a handsome cathedral with some good paintings, several other churches and convents, a theatre, hospital, orphan hospital, and scientific academy. The manufactures are woollen and silk goods, ironware, leather, and paper, and the trade is in these and agricultural produce. Pop. 7279.

FOSSIL (Latin *fossilis*, from *fodio*, I dig), literally anything dug out of the earth, but now signifying only the remains of organic bodies found in geological formations. See GEOLOGY and PALÆONTOLOGY.

FOSSOMBRONE (ancient *Forum Sempronii*), a town, Italy, 38 miles W.N.W. of Ancona, on both sides of the Metauro, here crossed by a remarkably bold bridge of a single arch. The battle which decided the fate of Italy in the second Punic war was fought here 207 B.C. between the Romans and the Carthaginians, in which the latter were totally defeated, and Hasdrubal their general was killed. Some ruins of the ancient city still exist; the principal modern edifice is a fine cathedral. The manufactures, consisting of silk and woollen goods, are in high repute throughout Italy. Pop. 6936.

FOSTER, JOHN, a distinguished essayist, was born in the parish of Halifax, Yorkshire, on 17th September, 1770. From his earliest years John was a shy and retiring boy, averse to the society of others of his own age, and much given to reading and solitary meditation. After a short trial of the weaving trade he was sent to the school of his pastor, Dr. John Fawcett, with the view of receiving an education and preparing himself for the Baptist ministry. After remaining there for a year or two he proceeded in 1791 to the Baptist college at Bristol, then the only theological institution belonging to that denomination. Here he remained for a twelvemonth, made the acquaintance of Hannah More and her sisters, and had an opportunity for the first time of hearing Robert Hall preach. He then obtained the charge of a small congregation at Newcastle-on-Tyne, where, however, he only continued for three months; he passed over to Ireland, and lived for a year in Dublin, first as a preacher and then as a schoolmaster. In 1797 he was appointed to a Baptist chapel at Chichester, from which in 1800 he removed to Downend, a village 5 miles from Bristol. On the recommendation of Robert Hall he became, in 1804, minister of a congregation at Frome, but after remaining there for two years an affection of the throat compelled him to resign his charge. A short time previous to this he had commenced contributing to the Eclectic Review, and for the next twelve years was a regular contributor to the extent of from ten to twenty articles annually. During his residence at Frome he published his four celebrated essays, which at once established his fame as an author and thinker, and made Sir James Mackintosh characterize him as 'one of the most profound and eloquent writers that England has produced.' In little more than a twelvemonth from their publication they passed through three editions, and in 1845 had reached their eighteenth. Their titles are—On a Man's writing a Memoir of Himself; On the Application of the Epithet Romantic; On Decision of Character; and On some of the Causes by which Evangelical Religion has been rendered Unacceptable to Persons of cultivated Taste. All are marked by great solidity and depth of thought, combined with a lucidity and nervousness of style which no English author has surpassed. Of the four essays the palm is generally given to that On Decision of Character, though in the opinion of Robert Hall the fourth of the series was the work on which Foster's fame with posterity would rest. It contains much cogent and pertinent reasoning, and has undoubtedly exercised great influence in dissociating from the minds of many the ideas of vulgarity and narrowness of mind in connection with the reception of evangelical doctrines. In 1808 Foster married the lady to whom his essays had originally been addressed in the form of letters. On this event taking place he removed to Bourton-on-the-Water, a retired village in Gloucestershire, where he remained for several years, writing for the Eclectic Review during the week, and preaching on Sundays in the neighbouring villages. As a preacher Foster never succeeded in attracting much attention. His discourses, though solid and philosophical, were of too abstract and unadorned a nature to be readily appreciated by a popular audience. In 1817 he returned to Downend, where he wrote his Essay on the Evils of Popular Ignorance, in which he exposed the fearful condition of the masses in our large towns and other places, and strenuously urged the establishment of a national system of education. In 1826 he lost his only son, who died of consumption, and several years afterwards his wife. He was now left with two daughters, whose affectionate attentions tranquillized and cheered his declining days. After gradually sinking for some weeks, he expired peacefully on 15th October, 1843. A selection of his contributions to the Eclectic Review was published by Dr. Price in 1844, and his Life and Correspondence, edited by J. E. Ryland (two vols.), in 1846, republished in Bohn's Standard Library in 1852.

FOTHERING, a peculiar method of endeavouring to stop a leak in the bottom of a ship while she is afloat, either at sea or at anchor, which is performed by fastening a sail at the four corners, letting it down under the ship's bottom, and then putting a quantity of chopped rope-yarn, oakum, wool, cotton, &c., between it and the ship's side. By repeating the latter part of this operation several times the leak generally sucks in a portion of the loose stuff, and thereby becomes partly and sometimes wholly stopped. Some persons prefer thrumming the sail instead of letting down the loose stuff; but in this mode the sail is soon chafed through by the hole, if the leak is considerable, without affording sufficient substance to stop it.

FOTHERINGAY, a village, England, county and 27 miles north-east of Northampton, pleasantly situate on the Neve. Its castle, to which a melancholy interest attaches as the scene of the imprisonment, trial, and execution of Mary Queen of Scots, was demolished by her son James I. Several of the illustrious Plantagenets are buried in its church.

FOUCAULT'S PENDULUM EXPERIMENT. M. Foucault, a French naturalist, pointed out a

curious and remarkable method of showing the rotation of the earth on its axis, by observing a vibrating pendulum, and his experiment goes under the above name. If a heavy ball is suspended by a fine wire and set to vibrate like a pendulum, it may easily be shown, either mathematically or by experiment, that the point of suspension, with the wire and ball, may be rotated round an axis, passing along the length of the wire, without interfering with the vibration. In other words, the *pendulum will continue to vibrate in the same plane, although the point of suspension be turned round the axis of suspension.* It follows immediately from this that if we could suspend a pendulum at the north or south pole and set it vibrating, it would continue to swing in the original plane of vibration; and as the earth is turning on its axis, a marked line on the earth's surface would appear to turn underneath the pendulum; or rather, it would seem to an observer, accustomed to feel as if the earth were at rest, that the plane in which the pendulum vibrates turns round relatively to the marked line on the earth's surface. It is easily shown that a similar phenomenon may be observed in any latitude except at the equator: the amount of rotation, however, that the plane of vibration of the pendulum seems to undergo is not so great in low latitudes as in high latitudes; but still in our latitudes rotation takes place to an extent easily observable. The performance of this experiment requires the greatest nicety. The pendulum is suspended on a fine wire, the support of the wire being constructed with great accuracy, so as not to interfere with the vibrations. The motion of the pendulum must be strictly confined to one plane; and, for that reason, in setting it to vibrate the bob is drawn aside and fastened by a silk thread, and when everything has come perfectly to rest the bob is released by burning the silk thread. During its subsequent motion it is protected from currents of air by glass screens. It need scarcely be remarked, however, that this beautiful experiment is nothing more than a fine illustration. Our knowledge of the rotation of the earth, drawn from astronomical considerations, cannot be strengthened by it. This experiment was first made public in 1851, when it was exhibited by M. Foucault before the Academy of Paris.

FOUCHÉ, Joseph, Duke of Otranto, born in 1763 at Nantes, received his education from the fathers of the oratory, first in his native town, and afterwards at Paris, where he distinguished himself by his rapid progress. The revolution, into which he entered with enthusiasm, found him teaching philosophy at Nantes. As he had not taken orders he married, became advocate, and was sent to the convention by the department of Loire-Inférieure. Here he was placed on the committee for public education, voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. In 1793 he was sent into the department of Nièvre to enforce the law against those who had incurred suspicion. In November, as a member of the convention, he accompanied the Commissioners Collot d'Herbois and Couthon to Lyons. In 1794, after his return, he incurred the hatred of Robespierre, and thus had a strong stimulus to assist in his downfall. In August, 1795, he was expelled from the convention, and kept a prisoner till the amnesty in October. In 1796 he communicated important information to the director Barras as to the designs of Babeuf, and was rewarded in 1798 by being sent to Milan as ambassador to the Cisalpine Republic. Here he laboured with General Brune to establish a second 18th Fructidor; both were in consequence recalled. He appeared in Paris in 1799, after Barras had gained the ascendency, and was appointed ambassador to Holland. Shortly after he was recalled and named minister of police. Here he first had full opportunity to display his great talents, and exercise an important influence on the interior policy of France. Sometime after he incurred the suspicion of the first consul, and in 1802 was suddenly deprived of his office; but he afterwards recovered favour, and in 1804 was again at the head of the police. The situation gave him great power during the war and the frequent absence of the emperor; but he appears to have used it with moderation, and exerted himself particularly to attach the royalists to the imperial throne. He had already obtained the title of count, and now received that of duke, with rich domains in the Kingdom of Naples. Napoleon, however, had repeated misgivings concerning him, and showed this particularly in 1810, when he deprived him of the ministry of police, and sent him as titular governor to Rome into a kind of exile. At this period he considered his rupture with Napoleon as almost final, and had serious thoughts of emigrating to the United States. At length he obtained permission to return to France and reside on his own estate, where he lived in private for several years. As Fouché and Talleyrand were resolved to keep away from the Russian campaign, Napoleon was with difficulty restrained from committing both of these dreaded men to prison. In the campaign of 1813 he sent for Fouché to his head-quarters at Dresden, sent him thence to Laybach as governor of the Illyrian provinces, and after the battle of Leipzig to Naples and Rome to watch the steps of Murat. When the latter revolted, Fouché was recalled to Paris, and by the way hesitated not to speak of Napoleon's approaching downfall. On the restoration of the Bourbons he pressed them to pursue a moderate course and proclaim a general amnesty; but as his advice was not followed, he retired into private life. On Napoleon's landing from Elba, the Bourbons offered him the ministry of police, and when he declined it gave order for his imprisonment. On the arrival of Napoleon he advised him, as a means of uniting all parties, to lay aside the title of emperor and place himself as generalissimo at the head of the republic. He, however, accepted the ministry of police, and entered into communication with the courts of Austria and Great Britain. When the proclamation of the European powers appeared he wished Napoleon to make a timely abdication in favour of his son, but all his counsels were received with suspicion and distrust. After the battle of Waterloo, Fouché urged Napoleon's second abdication, and advised him to seek an asylum in the United States. He placed himself at the head of the provisional government, negotiated the capitulation of Paris, obtained the removal of the army behind the Loire, and thus prevented useless bloodshed. Louis XVIII., whose return to the throne he had not at all supported, made him again minister of police; and it is to his credit that he laboured so zealously in favour of moderate measures as to incur the hatred of all the ultra-royalists. At last, however, he yielded so far to their wishes as to publish a proscription containing a list of thirty-seven persons, but he thus only placed himself in a false position by offending the moderate without at all conciliating the ultra party. He therefore resigned his ministerial office in 1815; and with his young wife, whom he had shortly before married out of an ancient house in Provence, proceeded as French ambassador to Dresden. As he was struck at by the decree issued in 1816 against the murderers of the king, he sought an asylum in Prague. He afterwards went first to Lintz, and then to Trieste, where he died in 1820. It was Fouché who made the famous remark on the execution of the Duke of Enghien, of which he disapproved: 'C'est plus qu'un crime, c'est une faute' (It is more than a crime; it is a blunder).

FOUGÈRES, a town, France, in the department of Ille-et-Vilaine, on a height, 28 miles N.E. of Rennes. It was once fortified, so as to be considered one of the keys of Brittany, but is now open, well built, and has manufactures of coarse flannels, sailcloth, sacking, lace, and hats, dye-works, tanneries, glass-works, paper-mills, and a considerable trade. The town was taken by Henry II. of England in 1166, and again in 1173. It fell again into the hands of the English in 1488. In 1793, during the Vendean war, an important battle was fought in its vicinity. Pop. 9580.

FOUL, a sea phrase that is used in distinction from *clear*, and implies *entangled, embarrassed*. Hence *foul anchor*, when the cable is twisted round the stock and flukes; *foul bottom*, when a bay is covered with weeds, grass, shells, filth, and rocks. *Foul hawse* means that the cables are turned round each other, by the ship having swung the wrong way when moored. *Foul rope*, a rope entangled, and unfit for immediate use. *Foul water* is water troubled and rendered turbid by the ship's bottom rubbing on the ground. *Foul wind* is used to express that the wind is unfavourable or contrary to the ship's course.

FOULAHS. See FELLATAHS.

FOULIS, ROBERT and ANDREW, two eminent printers of Glasgow, were born there—the former in 1707, the latter in 1712. Though in humble circumstances, they were both well educated, and availed themselves of the advantages of the Glasgow University, Robert apparently only to gratify his thirst for knowledge, and Andrew with a view to the church. In 1739 Robert commenced business in his native city as a bookseller; and in 1742, having obtained the appointment of printer to the university, began in that capacity to issue editions of the ancient classics, which have made his press famous, both from the beauty of their type and their accuracy. In this latter respect one of his editions of Horace stands pre-eminent, and is hence known by the name of the 'Immaculate' edition. The sheets, as they issued from the press, were hung out of the window for examination, with the offer of the reward of a guinea for any blunder detected in them. Tempting as the offer must have been, it did not secure perfect accuracy, for the 'Immaculate' edition contains at least ten typographical errors, of which a list has been given by Mr. Dibdin. After some years Andrew entered into partnership with his brother, and their business continued to prosper. Unfortunately they entered into a speculation for the establishment of an academy of the fine arts, and involved themselves in expenses which consumed the profits of their press, and absorbed the capital which ought to have been devoted to it. Disaster ensued; and the press, which had come to be regarded as a secondary object, fell from its high character, particularly after the death of Robert, on the 18th of September, 1775. Andrew, who survived till 1781, had far less talent than his brother, and entirely failed either to restore the character of the Foulis' press or improve the circumstances of his family.

FOUNDATION, in architecture, is that part of a building which is under ground, and which Palladio makes as deep as one fourth part the height of the whole building, unless there be cellars, when it may be somewhat lower. The practice of the ancients of laying the foundations on concrete (lime mixed with coarse gravel and small stones) has lately been revived with much success in cases where the soil is soft. Sand also forms a good foundation, provided it be prevented from spreading laterally.

Foundation, in ecclesiastical or political matters, is a donation or legacy, in money or lands, for the maintenance or support of some useful or charitable institution, as an hospital, a college, a school, &c.

FOUNDER, to sink or go down; the fatal situation of a ship which is no longer able to keep above water, through accident or the violence and continuation of a storm, and the extent of the leaks that fill her with water.

FOUNDER, an artist who casts metals in various forms, for different uses, as guns, bells, statues, types, &c.

FOUNDING. See CASTING.

FOUNDLING, a child abandoned by its parents, and found by strangers. Though infanticide was not punished among the ancient nations, yet natural feeling would prompt parents rather to expose their offspring, and leave their fate to accident. They usually selected places which were much frequented, where there was a greater chance of the child being saved. In Athens and Rome they were exposed in particular places. In the fourth century the emperors Valentinian, Valerius, and Gratian prohibited this cruel practice, which is at present a crime by the laws of all civilized nations. Even in ancient times the state made provision for the preservation of exposed children; but foundling hospitals are an institution of modern times.

The foundling hospital in Paris was formally established in 1670, and, up to 1807, had received 464,628 children. In France the number of foundlings admitted into the hospitals during the seventeen years ending in 1841 was 849,612. Of these 509,222, or considerably more than a half of the whole, died. According to Benoiston de Châteauneuf, author of a prize essay on the subject, the number of foundlings has increased, in the last forty years, in almost all European countries, but in the greatest proportion in France. The Foundling Hospital in London was established by Captain Thomas Coram in 1739, as an hospital for exposed and deserted children. It was for a time extremely popular, and was assisted on many occasions by parliamentary grants; but the enormous increase of abandonments, and the expense which they occasioned, produced such an alteration in public opinion that the hospital was changed in 1760 to what it now is, an hospital for poor illegitimate children whose mothers are known. Foundling hospitals are said to diminish not only the exposing of children, but also render infanticide and intentional abortion less frequent. The objection that foundling hospitals contribute to the corruption of morals is the strongest which can be urged against such institutions, and is not easily answered. The objection formerly drawn from the great mortality in foundling hospitals has been removed in some degree by improvements in the regulation of these establishments, particularly by sending the children into the country to be nursed. It is, however, admitted by the advocates of the system that three-fourths of the children never reach the age of seven years. Those who do survive, and are thrown upon the world without friends or means, constitute a large proportion of the thieves and prostitutes of the country. All exposed children in Britain are brought up at the expense of the parish in which they are found.

FOUNT, or FONT, among printers, &c., a set of types, sorted for use, that includes running letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, &c.; as a fount of English, of Pica, Bourgeois, &c. A fount of 100,000 characters, which is a common fount, would contain 5000 types of *a*, 3000 of *c*, 11,000 of *e*, 6000 of *i*, 3000 of *m*, and about 30 or 40 of *k*, *x*, *y*, and *z*. But this is only to be understood of the lower-case types; those of the upper case having other proportions, which we need not here enumerate.

FOUNTAIN, or ARTIFICIAL FOUNTAIN, in hydraulics, a machine or contrivance by which water is

violently spouted or darted up; called also a *jet d'eau*. There are various kinds of artificial fountains, but all formed by a pressure, of one sort or another, upon the water, viz., either the pressure or weight of a head of water, or the pressure arising from the spring and elasticity of the air, &c. When these are formed by the pressure of a head of water, or any other fluid of the same kind with the fountain or jet, then will this spout up nearly to the same height as that head, abating only a little for the resistance of the air, with that of the adjutage or pipe from which the water spouts, &c., in the fluid rushing through; but when the jet is produced by any other force than the pressure of a column of the same fluid with itself, it will rise to such a height as is nearly equal to the altitude of a column of the same fluid, whose pressure is equal to the given force that produces the fountain. In ancient Greece every principal town had public fountains or conduits, some of which were of handsome design and of beautiful execution. In the city of Megara, in Achaia, there was a public fountain established by Theagenes, which was celebrated for its grandeur and magnificence. The *Pirene*, a fountain at Corinth, was encircled by an inclosure of white marble, which was sculptured into various grottoes, from which the water ran into a splendid basin of the same material. Another fountain in Corinth, which was called *Lerna*, was encircled by a beautiful portico, under which were seats for the public to sit upon during the extreme heats of summer to enjoy the cool air from the falling waters. In the sacred wood of Æsculapius, at Epidaurus, there was a fountain that Pausanias cites as remarkable for the beauty of its decorations. At Messina there were also two elegant fountains, one called *Arsinoë* and the other *Clepsydra*. Pausanias also alludes to several other fountains in various parts of Greece, celebrated for the grandeur and beauty of their architectural and sculptural decorations.

The ancient fondness for fountains still exists in Italy and the East. The French are celebrated for their fountains, but Italy, more particularly Rome, is still more so. The fountains of Paris and of the Tuileries, of the orangery at Versailles, at St. Cloud, and other places in the neighbourhood, are splendid structures. The principal and most admired fountains at or near Rome are those in front of St. Peter's, of the Villa Aldobrandini at Frascati, of the Termini, of Mount Janiculum, of the gardens of the Belvedere, in the Vatican, of the Villa Borghese, which has also in the audience chamber a splendid fountain of silver, five Roman palms in height, ornamented with superb vases and flowers; the fountains of Trevi, the three fountains of St. Paul, of the Acqua Acetosa, and many others described in the numerous works on that ancient city. Sir Henry Wotton describes, in his Elements of Architecture, a fountain by Michael Angelo, in the figure of a sturdy woman wringing a bundle of clothes, from whence the water issues that supplies the basin. Owing to the modern mode of distributing the supply of water in pipes through the houses, fountains are now for the most part merely ornamental. It is found, however, that in large towns public supplies of water are wanted for man and beast, and these are now furnished by the numerous drinking fountains which are being erected in all our important towns.

FOUQUÉ, Friedrich Heinrich Karl, Baron de la Motte, a German poet and novelist, born at Brandenburg in 1777, served as lieutenant of the Prussian guards in the campaign of 1792, and thereafter lived in rural retirement, devoting himself to the muses. At a later period he returned to the army, and was present in 1813 at the most important battles in the war of Liberation, till, in consequence of a severe strain, he was obliged to take his discharge, after attaining the rank of major. He latterly divided his residence between Paris and his own estate near Rathenow, then lived several years at Halle, and died at Berlin in 1843. As a writer he is remarkable both for variety and fecundity, and has published poetry in almost all its forms—dramatic, epic, romantic, &c. Several of his short romantic tales in prose, such as Der Zauberring, Auslaga's Ritter, but more especially his Undine, enjoy an extraordinary popularity. The last mentioned tale, a charming mixture of fairy ideality, the reality of humble life, and the glow of chivalry, has gone through many editions, and has been translated into every European language. It must be admitted that Fouqué, while possessing many of the virtues of the romantic school, was guilty of all its extravagances, and that the descriptions of chivalric and feudal life, in which he delighted, are mere fancy pictures.

FOUQUÉ, Heinrich August, Baron de la Motte, a distinguished Prussian general in the Seven Years' war, born in 1698, was descended from an old Norman family which had fled on account of religious persecutions to the Hague. Fouqué possessed the confidence of Frederick the Great; and the Mémoires du Baron de la Motte Fouqué (two vols. Berlin, 1788, by Büttner, the secretary of Fouqué), which contain his correspondence with Frederick the Great, are therefore highly interesting. His nephew has written his life (Berlin, 1825) from family papers. General Fouqué died May 2d, 1774. The poet and novelist Fouqué, the subject of the preceding article, was grandson of this gallant soldier.

FOUQUIER-TINVILLE, Antoine Quentin, notorious for his ferocious cruelty in the first French revolution, was born at Hérouelles, near St. Quentin, in 1747. His excesses obliged him to sell the place of a *procureur au Châtelet* (attorney in the court of this name) which he had purchased, and to declare himself insolvent. As a member of the revolutionary tribunal he distinguished himself by his alacrity in pronouncing the verdict of guilty, and attracted the attention of Robespierre, who gave him the office of public accuser before this tribunal. The victims now became numberless. Fouquier drew up the scandalous articles of accusation against the queen, Marie Antoinette. His thirst for blood seems to have been increased by gratification, until it became a real insanity. He proposed the execution of Robespierre and all the members of the revolutionary tribunal 9th Thermidor, 1794, was himself removed on the 14th Thermidor (August 1), 1794, and arrested. He died May 7, 1795, under the guillotine, in a cowardly manner. There does not appear to be a trait in the life of this monster which can entitle his crimes to the same palliation as those of Robespierre, who considered the extermination of the aristocracy as a necessary evil.

FOURCHAMBAULT, a town, France, in the department of Nièvre, situated on the right bank of the Loire, about 4 miles north-east of Nevers. It is remarkable for its extensive iron-smelting furnaces and forges, which give employment to about 5000 workmen. The Loire is here spanned by a fine iron bridge, and from the height on which the parish church has been erected a magnificent view of the valley of the river is obtained. Pop. 6495.

FOURCROY, Antoine François de, a celebrated French chemist and natural philosopher, was born in Paris, June 15, 1755, and educated at the college of Harcourt. Though well descended his father was very poor, and for the first eighteen years or more of his life Fourcroy had a very hard struggle for existence. He taught writing, and even thought of

becoming an actor; but the ill success of one of his friends deterred him. Having adopted the profession of medicine he applied himself closely to the study of the sciences connected with it, and especially to chemistry. He published in 1776 a translation of Ramazzini's Treatise on the Diseases of Artisans. In 1780, after great opposition, and only when the fees required had been subscribed by his friends, he took the degree of M.D.; in 1784 he was made professor of chemistry at the Jardin du Roi; and the next year he was chosen a member of the Academy of Sciences. At this period he became associated with Lavoisier, Guyton-Morveau, and Berthollet in the researches which led to the vast improvements and discoveries in chemistry which have immortalized their names; and, along with them, he drew up the Méthode de Nomenclature chimique (Paris, 1787, 8vo). When the revolution took place he engaged in politics, and was chosen a deputy from Paris to the national convention. He did not, however, take his seat in that assembly till after the fall of Robespierre. In September, 1794, he became a member of the committee of public safety. His attention in this post was chiefly directed to the formation of public schools and the establishment of institutions for the education of youth. He organized the central school of public works, out of which the polytechnic school afterwards sprang, and co-operated in the establishment of the normal schools. In September, 1795, he passed into the council of ancients, and was nominated professor of chemistry and a member of the National Institute. He vacated his seat in the council in May, 1797, and in December, 1799, Bonaparte gave him a place in the council of state, in the section of the interior, in which place he drew up a plan for a system of public instruction, which, with some alteration, was adopted. He died December 16, 1809. His works are numerous, among which the following are the most important: Leçons Elémentaires d'Histoire naturelle et de Chimie (1791, five vols. 8vo); Système des Connaissances chimiques, et de leurs Applications aux Phénomènes de la Nature et de l'Art (1805, ten vols. 8vo); Philosophie chimique, 8vo; Tableaux synoptiques de Chimie (1805); and La Médicine éclairée par les Sciences physiques (four vols. 8vo). He also published many papers in the Memoirs of the Academy of Sciences, and in other periodicals, especially on the various substances prepared from animals. In these investigations he was frequently assisted by Vauquelin, and it has been said that Fourcroy's share consisted in drawing up the results. Be this as it may, Fourcroy made no discovery which had influence on the science as a whole, but he contributed largely to the progress of Lavoisier's views by his writings and lectures. As a lecturer indeed he was extremely successful, and crowds of listeners attended his courses. The same qualities are found in his writings, though these are now only of historical interest.

FOURIER, François Marie Charles, a French socialist, and founder of the system named after him, was born in 1772 at Besançon. It was the intention of his father, a cloth dealer, who died when his son had scarcely reached his ninth year, and to whom he left a legacy of over £3000, that he should devote himself to commerce. He studied with but moderate success in the college of his native town, and subsequently at Rouen and Lyons occupied subordinate situations in mercantile houses. In the last-mentioned town he entered into business on his own account, but the siege of the city by the troops of the convention and the subsequent disorders were fatal to his prosperity, and for two years he served as a conscript. He was afterwards employed by a firm in Marseilles, and an incident occurred while here which influenced the whole of his after-life. In order to keep up the price of rice in the market his employers had retained a cargo until it was unfit for use, and Fourier was instructed to have it thrown into the sea. This proceeding seemed so infamous that he took, as he expressed it, 'the oath of Hannibal against trade'—an oath to which he remained true in his doctrine, and in numerous writings, published under difficult circumstances. His system, of which a short account is given below, is most fully detailed in his Traité de l'Association domestique agricole —a strange work, which contains highly intellectual passages amidst a mass of absurdities and eccentricities, in a harsh and obscure style, and a new-fangled terminology. He died in 1837, so firmly persuaded of the practicability of his scheme that he is said, for a period of many years, to have returned home daily at a certain hour in the hope that at length some wealthy convert to his system would appear and furnish him with capital to enable him to carry the theory into effect. An association established under his direction in 1830, and a journal, the Phalange, started to enlighten the public as to the merits of the system, both met with speedy failure; but Fourier held that the scheme had not got fair play, and that it was not from inherent defects in the theory that the undertaking was a failure.

FOURIER, Jean Baptiste Joseph, a distinguished French mathematician, born of an influential family at Auxerre in 1768, was educated in the military school there, became one of its teachers at the age of eighteen, was afterwards in the Paris normal school, and after holding an appointment for a short time in the polytechnic school followed Bonaparte to Egypt. Here he performed important political service, and was likewise secretary of the Institute of Egypt and an active contributor to the Description de l'Égypte, the masterly introduction to which was written by him. After his return he was, in 1802, appointed prefect of the department of Isère, and in 1808 named a baron. In his capacity as prefect he accomplished what had for a century been earnestly desired, the draining of the marshes in Bourgoin, near Lyons. After Napoleon's return from Elba Fourier issued a royalist proclamation, but was nevertheless appointed prefect of the Rhone, though soon after deprived of the office. He now established his residence in Paris, lived entirely devoted to study, and was in 1815 admitted a member of the Academy of Sciences, and at a later period appointed secretary for life. He died in 1830. His most celebrated work is the Théorie analytique de la Chaleur, in which he employs entirely new methods of mathematical investigation. A kindred subject is considered in his Mémoire sur les Temperatures du Globe terrestre et des Espaces planetaires. In connection with the subject of heat he studied the theory of equations, which is indebted to him for several important improvements. Equally important is his work, Analyse des Equations determinées, which was left unfinished, but published after his death by Navier.

FOURIERISM, the social system constructed by F. M. C. Fourier. It does not contemplate the abolition of private property, nor even of inheritance; on the contrary, it avowedly takes into consideration, as an element in the distribution of produce, capital as well as labour. The operations of industry should be carried on by *Phalansteries*, or associations of 1800 members combining their labour on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first assigned for the subsistence of every member of the society, whether capable or not of labour. The remainder of the pro-

duce is shared in certain proportions to be previously determined among the three elements, labour, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupies in the several groups of labourers to which he or she belongs, these grades being in every case conferred by the voice of his or her companions. The remuneration received would not of necessity be expended in common. Separate rooms or sets of rooms would be set aside for those who applied for them, no other community of living being contemplated than that all the members of the association should reside in the same pile of buildings, for saving of labour and expense not only in building but in all the processes of domestic life, and in order that, the whole buying and selling of the community being effected by a single agent, the enormous portion of the produce of industry now carried off by the profits of mere distribution might be reduced to the narrowest possible margin.

FOURTEENTH, in music, the octave or replicate of the seventh—a distance comprehending thirteen diatonic intervals.

FOURTH, in music, a distance comprising three diatonic intervals, or two tones and a half.

FOU-SCHAN, a town, China, on the island of Si-Kiang, 21 miles E.N.E. of Canton; pop. about 200,000. It has manufactures of silk and cotton goods, porcelain and ironware, sugar-refineries; and an extensive trade.

FOWL (Anglo-Saxon *fugel*, German *vogel*, a bird connected with the verb to *fly*), a word originally synonymous with bird, now used in a stricter sense to designate the genus *Gallus*, of which the common barn-door fowl is a familiar example. The general form and characters of the bill, feet, &c., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles—characters which are most conspicuous in the males. Referring to our article Cock we proceed to mention a few of the more notable examples of this genus. The *Jungle Fowl*, a native of India, is a powerful bird in proportion to its size, which is rather less than that of the domestic fowl. The back and lower portions of the body are deep gray, and the tail is long, arched, and beautifully coloured with changing hues of purple, green, and gold. The *Bankiva Jungle Fowl*, now supposed to be the original stock of the domesticated poultry, is a native of Java. The male closely resembles the English game-cock. The comb and wattles are of the brightest scarlet, the long hackles of the neck and lower parts of the back are fine orange red, the upper part of the back is deep blue-black, and the shoulder ruddy chestnut. The long, arched, and drooping tail is blue-black, glossed with green, and the breast and underparts black. The *Cochin-China Fowl*, a large and ungainly bird, is valuable chiefly owing to its fecundity, eggs being laid even during winter. The *Game Fowl* is noted for his pugnacity, his bright plumage, and excellent flesh. The *Dorkings* are a short-legged, round-bodied plump breed, remarkable for having at least one and sometimes two supplementary toes. The *Spanish Fowl* is a very fine variety, glossy black, with a large comb. It is next in size to the Cochin-China breed, but much superior in symmetry. Its flesh is excellent, and the hens are regular layers, so that the bird is in high estimation with poultry keepers. The *Bantam*, a puny little member of the tribe, is remarkable for its fierce courage, its full breast, and feathered legs. It is of little use to the breeder, and may be classed among the fancy fowls, of which there seems to be infinite variety. The common *Barn-door Fowl* is of no particular breed, no pains being taken to prevent crossing, but is a kind of compound of all the foregoing except the bantam, from which it should be kept separate, as tending to diminish the size of the birds and their eggs.

FOWLING. See Bird-catching.

FOX. This well-known animal is a native of almost every quarter of the globe, and has been esteemed the most sagacious and crafty of all beasts of prey. The former quality he demonstrates in his mode of providing himself an asylum, and the latter in his schemes for catching his prey. The fox belongs to the genus *Canis* of naturalists, and has been formed into a subgenus on account of its longer and more bushy tail, more pointed muzzle, nocturnal pupils, less slanting superior incisive teeth, fetid odour, and habit of burrowing. All the species are equally wily and voracious, greedily devouring birds and small quadrupeds, disliked and betrayed by most of those animals who have a dread of his attacks, and extremely difficult to be tamed, even when caught very young. The fox, like the wolf, is the constant object of persecution, from the ravages he commits not only on domestic animals, but also on some fruits. He has been the destroyer of grapes from the earliest records. He devours honey, sucks eggs, carries off poultry, and, in fact, commits mischief in every possible form. The following is the arrangement given in the British Museum Catalogue, by Dr. J. E. Gray:—A. Large. *a.* European: *V. vulgaris*, Fox. *b.* African: *V. Nilotica*, Sobora (Arab), Tahaleb (Egyptian). *V. adusta*, Caffraria. *V. variegata*, Schomor Abu. *V. mesomelas.* *c.* Asiatic: *V. flavescens*, Persian fox. *V. montana*, hill-fox of Nepal. *V. Griffithsii*, Affghanistan. *d.* American: *V. Pennsylvanica* (*decussata*), crossed fox. *V. velox* (*cinereo-argentata*), burrowing fox. B. Small. Asiatic: *V. ferulata*, Thibet. *V. leucopus*, *V. Japonica*, *V. Bengalensis*, the kokree. *V. pusilla*, Punjaub. *V. karagau*, Ural. *V. corsac*, Tartary.

The *Common Fox* of Europe (*Vulpes vulgaris*) exhibits a great degree of cunning in digging young rabbits out of their burrows. He does not enter the hole, as in such case he would be obliged to dig several feet along the ground under the surface; but he follows their scent above till he comes to the end where they lie, and then, scratching up the earth, descends immediately upon and devours them. The den of this fox is so contrived as to afford the best possible security to the inhabitant, being situated under hard ground, the roots of trees, &c., and furnished with proper outlets for the purpose of escape, if necessary. He is one of those animals that are made the objects of diversion in the chase. When he finds himself pursued he usually makes for his hole, and, penetrating to the bottom, lies quiet till a terrier is sent in to him. If his den is under a rock or the roots of trees, which is often the case, he is safe, for the terrier is no match for him there, and he cannot be dug out. When, as is generally practised, the retreat to his den is cut off, his stratagems and shifts to escape are various. He always seeks the most woody parts of the country, and prefers such paths as are most embarrassed by thorns and briers. He runs in a direct line before the hounds, and at no great distance from them. When overtaken he fights very obstinately. He posseses astonishing acuteness of smell. During winter he makes a continual yelping, but in summer he is usually silent. In Japan the natives believe him to be animated by the devil, and their writings are full of strange accounts respecting him.

Black Fox (*V. aryentatus*).—This species is strik-

ingly similar to the common fox, and is only distinguishable by its copious and beautiful fur, which is of a rich and shining black colour, having a small quantity of white mixed with it in different proportions. It inhabits the northern part of Asia and America; but a comparison of those of the latter country with the former will probably prove them to be distinct, as has been suggested by F. Cuvier.

Red Fox (*V. fulvus*).—This species is found throughout North America, and has been considered as identical with the common fox of Europe, though there can be no doubt of their difference. The general colour of this fox in summer is bright ferruginous on the head, back, and sides. Beneath the chin it is white, whilst the throat and neck are of a dark gray. The under parts of the body towards the tail are very pale red. It is about 2 feet long and 18 inches high. The skins are much sought for, and are employed in various manufactures. When caught young this fox may be domesticated to a certain degree, but they are always unpleasant from the fetor of their urine.

Crossed Fox (*V. Pennsylvanica* or *decussata*).—This differs very much from the common fox. The colour of his fur is a sort of gray, resulting from the mixture of black and white hair. He has a black cross on his shoulders, from which he derives his name. The muzzle, lower parts of the body, and the feet, are black; the tail is terminated with white. It inhabits the northern parts of America, and may perhaps be only a variety of the black fox.

Swift Fox (*V. velox*, Say).—This beautiful little animal, which was first accurately described by Mr. Say, inhabits the great plains which lie at the base of the Rocky Mountains. It is much smaller than the other American species, and forms its habitation by burrowing. It is distinguished by its extraordinary speed, which appears to surpass that of any other animal. It can pass the fleetest antelope, and seems rather to fly than touch the ground in its course. It is even stated, that such is its rapid motion, that the effect produced on the eye is that of a line swiftly drawn along the surface, the parts of the animal's body being wholly undistinguishable. Its body is slender, and the tail rather long, cylindrical, and black. The hair is fine, dense, and soft. It somewhat resembles the *V. corsac*, which inhabits the vast plains of Tartary.

Gray Fox (*Urocyon Virginianus* or *cinereo-argentatus*) is common throughout the northern parts of America, more particularly in the neighbourhood of habitations. Its general colour is gray, becoming gradually darker from the shoulders to the hips. It has a sharp head, marked by a blackish-gray triangle, which gives it a peculiar physiognomy. The tail is thick, and contains at its tip a tuft of stiff hairs, hence the sub-generic distinction of the bristle-tailed foxes.

Arctic Fox (*V. lagopus*).—This is smaller than the common fox; its nose is sharp, but the skull is shorter than in the European fox. It is now erected into a distinct sub-genus of *Canis*, under the name *Leucocyon*. It has short rounded ears almost hid in its fur; its hair is long, soft, and somewhat woolly; its legs are short, having the toes covered with fur, like those of the hare: hence its specific name. It inhabits the countries bordering on the Frozen Ocean in both continents. In October and November, like the common fox, it is the most sleek and has the best coat of hair, which, later in the season, becomes too thick and ragged. As the winter commences it grows perfectly white, changing colour last on the ridge of the back and tip of the tail. In April and May it begins to shed its coat. In June it drops its cubs, from three to five in a litter. This fox preys upon various small quadrupeds, such as hares, marmots, &c., as well as upon partridges and other birds, the carcasses of fish left on shore; and, driven by necessity, it will eat indiscriminately whatever may promise to allay its hunger. We are informed by Mr. Crantz that it exerts an extraordinary degree of cunning in taking fish. It goes into the water, and makes a splash with its feet in order to attract them, and when they come up immediately seizes them. It is taken with great facility in traps; and it is a singular circumstance that these animals will prey on each other, when they find individuals killed, wounded, or caught, as readily as upon any other food. Their skins are not of any great value.

FOX, CHARLES JAMES. This eminent statesman was the second son of Henry, first Lord Holland, so long the rival and opponent of the Earl of Chatham. Charles James was born January 24, 1749, and early became a favourite with his father, who, perceiving indications of great capacity, mingled exceeding indulgence with the most careful attention to his education. He was sent to Eton, whence he removed to Hertford College, Oxford; and his classical acquirements were very considerable. His father procured him a seat for the borough of Midhurst in 1768, before he was of legal age, and in 1770 the same interest procured him the office of one of the lords of the admiralty, which situation he resigned in 1772, and was appointed a commissioner of the treasury. Acting at this period under the influence of his father, his parliamentary conduct led to little anticipation of his future career. He spoke and voted against Wilkes, but warmly supported Sir William Meredith's bill to give relief from subscription to the thirty-nine articles, and in several other respects asserted his independence.

After being a supporter of the administration for six years, Mr. Fox was ejected owing to a quarrel with Lord North, and was thrown into the ranks of the opposition. The adoption of the disastrous measures which terminated in the independence of the American colonies enabled him to take this part without opposing any of the policy which he had previously supported. During the whole of this eventful contest he spoke and voted in direct opposition to the ministerial system, and, in conjunction with Burke, Barré, Dunning, and other eminent leaders, displayed the highest talents both as a statesman and orator. In 1780 he became a candidate for the representation of the city of Westminster, and succeeded, although opposed by the whole influence of the crown. On the final defeat of the weak and calamitous administration of Lord North, and the accession of that of the Marquis of Rockingham, Mr. Fox obtained the office of secretary of state for foreign affairs. But the death of the Marquis of Rockingham suddenly divided the party; and on the Earl of Shelburne becoming first lord of the treasury, in preference to the Duke of Portland, Mr. Fox retired in disgust; and soon after a union took place between his friends and those of Lord North, which, under the name of *the coalition*, was odious to the great mass of the people. The temporary success of this party movement served only to render popular disgust the more general; and when, on occasion of the famous India bill, the dissatisfaction of the sovereign became apparent, the dismissal of the coalition excited general satisfaction. At the ensuing election nearly seventy of his friends lost their seats, and he had himself to enter into a strong and expensive contest for the representation of Westminster. Still, although in the new Parliament Mr. Pitt had a decided majority, Mr. Fox headed a very strong opposition, and political questions were for some years contested with a display of talent on both sides

which the House of Commons had seldom previously exhibited.

In 1788 Mr. Fox repaired to the Continent, and was proceeding to Italy when he was recalled by the king's illness, and the necessity of constituting a regency. The contest for the unrestricted right of the heir-apparent, which he warmly espoused, was marked by a great display of oratorical and logical talent on the part of the opposition; but, both in and out of Parliament, the majority on this occasion was with Mr. Pitt. In 1790 and 1791 Mr. Fox regained a share of popularity by his opposition to war with Spain and Russia, and also by his libel bill, regulating the rights of juries in criminal cases, and rendering them judges both of the law and the fact. On the breaking out of the French revolution he was disposed to regard it as likely to prove extremely beneficial. The contrary views of Mr. Burke, and the extraordinary manner in which that warm politician on that account publicly renounced his friendship, is one of the most striking incidents in parliamentary history. The policy of the war that followed belongs to history. Mr. Fox firmly opposed the principle on which it commenced, and strenuously argued for peace on every occasion; and at the Treaty of Amiens, in 1801, gave Mr. Addington, who concluded it, his support. When hostilities were renewed he also doubted of their necessity; but on becoming secretary of state for foreign affairs, in conjunction with the Grenville party, he acquiesced in its propriety. His political career was now, however, drawing towards the close; his health began rapidly to decline; symptoms of dropsy appeared; and in a few months after the death of Mr. Pitt, his great rival, was laid in an almost contiguous grave. Mr. Fox died September 13, 1806, without pain, and almost without a struggle.

The opinions formed of this eminent leader as a practical and theoretical statesman, it is unnecessary to say, have been as various as the shades of party difference. That he was a sincere friend to all the broad and generous principles on the due development of which rest the freedom and best interests of mankind, is not to be doubted, and that they were alloyed by great latitude on the subject of party and political expediency is equally clear. As a powerful and purely argumentative orator he was of the very first class; although as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, although highly forcible. Of his amiability in private life, allowing for a dissipated youth, all accounts agree. Friends and foes equally testify to his ingenuous and benign character. The result of this happy temperament was that no man was ever more idolized by a wide and extensive connection. As an author, besides some Latin poetry and a Greek dialogue, by which he highly distinguished himself at Eton, and a few numbers of a paper entitled The Englishman, he published nothing during his lifetime but A Letter to the Electors of Westminster (1793), which was read with great avidity. To his nephew, Lord Holland, the world is indebted for his posthumous publication, entitled The History of the Early Part of the Reign of James II., with an introductory chapter, intended to form a commencement of the history of the Revolution of 1688. It is written with unpretending simplicity, but disappointed expectation, and has never been popular. The latest, and in some respects the most competent biographer of Fox, is Lord John Russell.

FOX, GEORGE, the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, in 1624. His father, who was a weaver, educated him religiously. At an early age he was employed in keeping sheep. Subsequently he was apprenticed to a country shoemaker. At the age of nineteen he persuaded himself that he had received a divine command to forsake everything else and devote himself wholly to religion. He accordingly forsook his relations, equipped himself in a leathern doublet, and wandered from place to place, supporting himself as he could. Being discovered in the metropolis, his friends induced him to return; he, however, remained with them a very short time, resuming a life of itinerancy, in which he fasted much, walked abroad in retired places studying the Bible, and sometimes sat in a hollow tree for a day together. In 1648 he began to propagate his opinions, and commenced public preacher at Manchester; whence he soon after made excursions through the neighbouring counties, where he preached to the people in the market-places. About this time he began to adopt the peculiar language and manners of Quakerism, and experienced some of the persecutions to which all active novelty, in the way of religious opinion, was in those days exposed. At Derby the followers of Fox were first denominated *Quakers*, in consequence of their trembling mode of delivery, and calls on the magistracy to tremble before the Lord. In 1655 he was sent a prisoner to Cromwell, who, having ascertained the pacific tendency of his doctrines, had him set at liberty. He was, however, treated with great severity by the country magistracy, in consequence of his interruption of ministers during divine service, and exclamations in the churches, and was more than once obliged to the interference of the Protector for his freedom. On the occasion of a fast appointed on account of the persecution of the Protestants abroad, he addressed a paper to the heads and governors of the nation, in which he forcibly described the inconsistency of similar severity at home. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1669 he married the widow of Judge Fell, and soon after went to America, where he remained two years, which he employed in making proselytes. On his return he was thrown into Worcester jail, but was quickly released, and went to Holland. He soon after returned, and was cast in a suit for tithes, which he deemed it unlawful to pay. In 1684 he again visited the Continent, where he did not long remain; and his health becoming impaired by incessant toil, imprisonment, and suffering, he lived more retired until his death in 1691. Exclusive of a few separate pieces, the writings of Fox are collected into three vols. folio, the first of which contains his Journal, the second his Epistles, and the third his Doctrinal Pieces. He was undoubtedly a man of strong feeling and deep convictions; and William Penn speaks in high terms of his meekness, humility, and temperance.

FOXE, JOHN, an English church historian, was born at Boston, in Lincolnshire, in 1517. At the age of sixteen he was entered at Brasenose College, Oxford, and in 1543 was elected a fellow of Magdalen College, in the same university. Applying himself to theology with great assiduity, he secretly became a convert to the principles of the Reformation. This tendency being at length suspected, a charge of heresy followed, and by the judgment of his college he was, in 1545, expelled. In the reign of Edward VI. he was restored to his fellowship; but in the reign of Mary, understanding that Gardiner was devising means to seize him, he went abroad, and gained a livelihood by correcting the press for an eminent printer at Basel, where he laid the first plan of his Acts and Monuments of the Church. On the accession of Elizabeth he returned to his native country, and was received in the most friendly manner by his

former pupil, the Duke of Norfolk, who maintained him as long as he lived, and settled a pension on him at his death. Secretary Cecil also obtained for him a prebend in the church of Salisbury; and he might have received much higher preferment if he would have subscribed to the articles enforced by the ecclesiastical commissioners. In 1575 a persecution took place of the Dutch Anabaptists, when Foxe sought an audience of Elizabeth, and endeavoured to convince her of the cruelty and injustice of condemning them to the flames. He died, greatly esteemed and lamented, in 1587, in his seventieth year. His principal work is the History of the Acts and Monuments of the Church, commonly called Foxe's Book of Martyrs, first printed in 1563, in one vol. folio; reprinted in 1632 and 1641 in three vols. folio. In 1684 it had reached the ninth edition.

FOXGLOVE. See DIGITALIS.

FOX-SHARK, or THRESHER. See SHARK.

FOXTAIL GRASS (*Alopecurus*), a genus of grasses belonging to the division of the order in which the spikelets are strictly one-flowered, and the inflorescence very close. It has a pair of very sharp glumes, compressed sideways, and a single pale, bearing an awn or beard at the back. The only species of agricultural value is the Meadow Foxtail (*A. pratensis*), a fibrous-rooted perennial forming a close herbage, and producing straw from 2 to 3 feet long. The sheath of the upper leaves is a little inflated; the ear is about 2 inches long, blunt, nearly cylindrical, and covered with silky hairs. The glumes are of equal length; the pale is of the same length, and much shorter than the projecting awn. It does not thrive on dry soils, but as it bears mowing well it is useful in the formation of lawns. An inexperienced observer may mistake for this the Field Foxtail (*A. agrestis*), a mere weed, very common in English meadows, but rarely found in Scotland. That plant is readily known by its straw being rough to the touch near the ear, by its having a slender tapering ear, and by the glumes having scarcely any silky hairs except at the back edge. One or two other species are known, such as the Black Foxtail (*A. nigricans*), a Russian plant, deriving its name from the dark colour of its ears; and the *A. Tauntoniensis*, which seems to be closely related to the last, but more productive.

FOY, MAXIMILIAN SEBASTIAN, a distinguished French general and orator, was born at Ham, Feb. 3, 1775, and was educated in the military school at La Fère. In 1791 he joined the volunteers who hastened to defend the frontiers of their country. In 1792 he served in the artillery in the army of the North, under the command of Dumouriez, and afterwards under Dampierre, Custine, Houchard, Jourdan, and Pichegru, and was wounded in the battle of Jemappe. In 1794 the infamous Joseph Lebon, commissioner of the convention, caused him to be arrested, because Foy openly censured his excesses; the 9th Thermidor, however, saved his life. In the campaigns of 1795, 1796, and 1797 he served in the army of the Rhine and Moselle, distinguished himself particularly, in 1797, at the second passage of the Rhine, near Diersheim, and became the personal friend of Moreau—a circumstance which for some time operated unfavourably on his advancement. Towards the end of 1798 he served in Switzerland, under General Schauenburg, and in 1799 in the army of the Danube, under Masséna, where he assisted materially in the passage of the Limmath. In 1800 he was adjutant-general in the division of Moncey, in the army of the Rhine which marched through Switzerland into Italy, and commanded the vanguard of the army of Italy in the campaign of 1801, during which he defeated the enemy at the entrance of the Tyrol. On the renewal of hostilities with Britain in 1803 he received the command of the floating batteries intended for the defence of the coasts of the Channel. In 1805 he commanded the artillery of the second division in the Austrian campaign. In 1807 Napoleon sent him to Turkey, at the head of 1200 artillerists, to assist Sultan Selim against the Russians and British; but in consequence of the insurrection, in which Selim was dethroned, that corps returned to France. Colonel Foy, however, remained in Constantinople, and distinguished himself under the direction of the French ambassador, General Sebastiani, by the activity of his preparations for the defence of the Turkish capital and also of the Dardanelles. These were so effective that Duckworth, the British admiral, who approached the capital, was obliged to retire. From 1808 to 1812 Foy was general of division of the army in Portugal. July 21, 1812, after the defeat of the French at Salamanca, he succeeded Marmont as commander-in-chief, and conducted the retreat to the Douro. After Wellington had been obliged to raise the siege of Burgos, Oct. 21, 1812, General Foy advanced at the head of the right wing of the army of Portugal, and effected the passage of the Douro near Tordesillas, October 29. After the defeat of King Joseph and Jourdan at Vittoria, June 21, 1813, he collected 20,000 men at Bergara, beat back the left wing of the Spanish army, and defended every inch of ground, so that General Graham succeeded in carrying his position at Tolosa only after a most sanguinary conflict. General Foy, after reinforcing the garrison of St. Sebastian, retreated across the Bidassoa without loss. In the battles at Pampeluna and St. Jean-Pied-de-Port he commanded the left wing; and was present in all the battles of the Pyrenees, until he was dangerously wounded, Feb. 27, 1814. In 1814 and 1815 he was division-inspector of infantry. In the campaign of 1815 he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819 he was appointed division-inspector of infantry, and the same year was elected deputy by the department of the Aisne. A soldier, educated in the field, and covered with honourable scars, he now at once distinguished himself as an orator, and became the favourite of the nation. He always voted with the liberals, and proved himself the firm advocate of constitutional liberty. He distinguished himself particularly in the debates on the old laws of election, and those respecting the conscription, the war against Spain in 1823, and in all the debates on the guarantees of civil liberty. General Foy died November 28, 1825. Madame Foy published, from her husband's papers, a history of the Peninsular war, four vols. 8vo (translated into English). His Discours were likewise published after his death (Discours du Général Foy, précédés d'une Notice biographique, par M. P. F. Tissot; d'un Éloge par M. Étienne; et d'un Essai sur l'Eloquence politique en France, par M. Jay, Paris, 1826, two vols. 8vo).

FOYERS, FALLS OF, two romantic cataracts on the little river Foyers, Inverness-shire, which falls into Loch Ness, and within 1½ mile of its mouth. The upper fall is about 30 feet in height, twice broken in its descent, and a graceful bridge is thrown over the chasm. It is seen to the best advantage from the channel of the river below the bridge. The lower fall is described by Professor Wilson as the 'most magnificent cataract, out of all sight and hearing, in Great Britain.' Its height has been variously stated, but it cannot be less than 90 feet. In point of magnitude and volume of water it is inferior to the Falls of Clyde, but the wildness and darkness of the deep, narrow glen through which the torrent bursts its way, and the stupendous overhanging rocks,

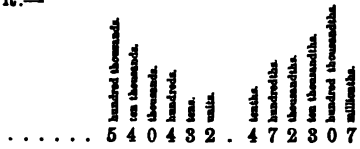
render this scene one of the most grand and imposing in the kingdom.

FOYLE, a river of Ireland, formed by various streams which unite near Strabane, in the county of Tyrone. Hence it flows north, past St. Johnstown and Londonderry, 4 miles below which it falls into Lough Foyle. It is navigable for vessels of 800 tons up to Londonderry, but smaller vessels can ascend to Strabane, 12 miles farther up.—LOUGH FOYLE, the estuary of the river Foyle, runs into the land on the north coast of Ireland, between the counties of Derry and Donegal. It is 16 miles long, from north-east to south-west, 1 mile wide at its entrance, and 9 miles broad along its south side. It is only navigable along its west side, and a great part is dry at low-water.

FRA, an Italian prefix, derived from the word *frate*, brother, and used before the names of monks; for instance, *Fra Giovanni*, brother John. Some monks have become famous under such names, as Fra Bartolommeo, the painter, and Fra Paolo, the celebrated Venetian monk.

FRACASTORO, GIROLAMO, an ingenious poet and philosopher, was born in 1483 at Verona in Italy. It is said that he came into the world without a mouth, having in the place of it a small aperture, which was enlarged by a surgical operation. One day when his mother was carrying him in her arms, and walking in a garden, she was killed by lightning, and the child was uninjured. He was patronized by Cardinal Bembo, to whom he addressed the most celebrated of his works, a Latin poem entitled Syphilis. In the latter part of his life he wrote a poem on the adventures of the patriarch Joseph; but his poetic fire seems then to have been exhausted, and the virtues of the hero were less happily celebrated than the horrors of the disease. He died at Padua of apoplexy in 1553, aged seventy-one. Among the moderns who have exercised their talents in the composition of Latin verse, few have obtained higher reputation than Fracastoro. The elder Scaliger ranks him as a poet next to Virgil, and his merit has been generally acknowledged. Besides the poems already noticed, he wrote another, entitled Alcon, sive de Cura Canum venaticorum. Among his prose works on professional topics are treatises De Sympathia et Antipathia; De Contagione et Morbis contagiosis, &c.

FRACTION (from the Latin *frangere*, to break) signifies, in arithmetic and algebra, a combination of numbers representing one or more parts of a unit or integer: thus, four-fifths is a fraction, formed by dividing a unit into five equal parts, and taking one part four times. Fractions are divided into *vulgar* and *decimal*. Vulgar fractions are expressed by two numbers with a line between them. The lower, the *denominator*, indicates into how many equal parts the unit is divided; and the number above the line, called the *numerator*, indicates how many of such parts are taken; as, in $\frac{7}{8}$, 8 is the denominator, 7 the numerator. Vulgar fractions have been divided, though not very accurately, into *proper*, *improper*, *simple*, *compound*, and *mixed*, namely:—A *proper fraction* is a fraction in which the numerator is less than the denominator, as $\frac{3}{4}$, $\frac{2}{3}$, $\frac{7}{8}$, $\frac{9}{11}$, $\frac{101}{1011}$, &c. An *improper fraction* is a fraction in which the numerator is equal to or greater than the denominator, as $\frac{5}{2}$, $\frac{3}{2}$, $\frac{12}{13}$, $\frac{117}{8}$, &c. A *simple fraction* consists of a single numerator and single denominator; and is either proper or improper, as $\frac{1}{7}$, $\frac{11}{11}$, $\frac{16}{81}$, &c. A *compound fraction* is a fraction consisting of two or more other fractions connected by the word *of*; thus $\frac{2}{3}$ *of* $\frac{3}{4}$, or $\frac{3}{4}$ *of* $\frac{7}{11}$ *of* $\frac{8}{9}$, &c., are compound fractions. A *complex fraction* is that whose numerator and denominator are both fractions; thus $\frac{\frac{3}{4}}{7\frac{1}{2}}$ is a complex fraction. An integer and fraction together is called a *mixed number;* that is, $7\frac{3}{4}$, $9\frac{1}{2}$, &c., are mixed numbers. Decimal fractions include every fraction the denominator of which is ten or a power of it; as $\frac{5}{10}$, $\frac{7}{1000}$, &c. Our beautiful system of writing numbers enables us to write decimal fractions without expressing the denominators, just as we are enabled to write whole numbers without saying whether they are units, hundreds, &c. The following scheme will explain it:—



The expression 540432·472307 is thus equivalent to $540432\frac{472307}{1000000}$. On the left of the point are the whole numbers; and just as every place in that series in proceeding to the left increases in value ten times, so every place to the right from the point decreases in value ten times. Writing decimal fractions is therefore only an extension of our system of writing whole numbers. Yet, though it is as simple as it is important, the system was unknown to the ancients, and was first discovered by the German mathematician Regiomontanus in 1464. All calculations in decimal fractions are very easy and simple. In working with decimals the integers are separated from the fractional numbers by a dot or period, so that this dot placed between several numbers is the characteristic sign of a decimal fraction. For instance, 5·36 is 5 whole numbers, 3 tenths, and 6 hundredths, or 36 hundredths.

FRACTURE (from *frango*, to break) is applied to the bones, and is divided into simple and compound; simple when the bone only is injured; compound when the soft coverings are so injured that either one of the fractured ends protrudes through the skin, or the skin and muscles are so lacerated as to expose the bone. The long cylindrical bones of the limbs are most frequently fractured; next the flat, particularly of the cranium (for those of the pelvis and scapula must be excluded); and, lastly, the round irregularly-shaped bones of the tarsus, carpus, and vertebræ. The bones are fractured by external violence, disease, and the action of the muscles. The long cylindrical bones are not unfrequently broken in more than one point; they are generally fractured at the centre of their shafts, in which case the fracture is more or less oblique, whereas, when it occurs near the extremes it becomes more and more transverse; hence fractures have been divided into oblique and transverse. The spongy bones are also fractured transversely; the flat bones in various directions, occasionally stellated. A comminuted fracture occurs when a bone is broken in different places at once, and divided into several fragments or splinters. Longitudinal fractures also occur to the long cylindrical bones. Complicated fractures are those accompanied with luxation, severe contusions, wounded blood-vessels, pregnancy, gout, scurvy, rickets, fragilitas ossium, and syphilis, which diseases prevent the union of the bones, and also cause them to be very easily broken. Cold renders the bones more fragile, and they are also more brittle in old age. The superficial are more exposed to fracture than the deep-seated bones; thus the clavicle is more so than the os innominatum. Others, from their functions, are more exposed; as, for example, the radius, from its affording support to the carpus. When a fracture takes place there is an effusion of blood from the vessels of the bone, periosteum, and contiguous soft parts; the muscles are violently excited; the periosteum and

truncated ends of the bone inflame, and after the inflammation subsides the vessels of the periosteum and ends of the bone secrete callus, which is an effusion of gelatin that is gradually converted into cartilage, and lastly into bone by the secretion of phosphate of lime, precisely in the same manner as the formation and conversion of bone in the fœtus. During the inflammatory action no diseased secretion takes place; nay, even the healthy natural ones are more or less suspended, so that no advantage is gained by setting a fracture immediately after the injury; on the contrary, this primary setting, as it is termed, re-excites the already spasmodic action of the muscles, and in nine cases out of ten disappoints the hopes of the surgeon. Callus does not harden for many days: in the adult it begins generally about the tenth or twelfth day. Boyer, however, says that it is not formed until between the twentieth and seventieth day. The treatment of a simple fractured bone is to lay the limb in the easiest position for the patient; to apply leeches and anodyne fomentations or poultices; to put him on low diet, enjoin perfect rest, and administer gentle laxatives until all inflammatory action is subdued; then to extend the limb to its natural length, or apply pasteboard splints dipped in warm water, with wooden ones exterior to them, and fastened with tapes. This latter is termed *secondary setting*, and is applicable to all the bones of the extremities.

FRA DIAVOLO, a celebrated Neapolitan brigand, whose real name was Michele Pezza. He was born in Calabria in 1760. He quitted the trade of stocking-weaving for the army, and served for a time in the Papal legion. He afterwards became a monk, but was expelled on account of misconduct. He then joined a troop of brigands, of which he became in a short time the leader. The government set a price upon his head; but when Cardinal Ruffo undertook to compel the French to evacuate Naples, Fra Diavolo was pardoned, was employed by the cardinal, and received a colonel's commission. At the head of his band he harassed the French, took refuge in Calabria after the conquest of Naples by Bonaparte, and incited the people against the French. He fell at last into their hands at San Severino in 1806 (his capture being effected by General Hugo, the father of the great poet). He was executed as a robber and incendiary. Scribe the dramatist, and Auber the composer, have made the name familiar; but the opera has nothing in common with the real Fra Diavolo except the name.

FRAME-BRIDGE, a bridge built of timber, &c. See Timber Bridge under article BRIDGE.

FRANC, a French silver coin, containing ten *décimes* and a hundred *centimes*. Value about 9½*d.*; or 25 francs = £1 sterling.

FRANCAVILLA, several places in Southern Italy. The most important is in the province of Otranto, occupies a height 14 miles W.S.W. of Brindisi; is well built, with a handsome parish church, a college, and several convents and hospitals; manufactures of woollen stuffs, cotton hosiery, earthenware, and snuff; and a considerable trade in wine, oil, and cotton. A great part of the town was destroyed by an earthquake in 1734. Pop. 15,943.

FRANCE (anciently *Gallia*), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states.

General Description.—France is situated between lat. 42° 20′ and 51° 5′ N.; and lon. 4° 50′ W. and 7° 40′ E., and is bounded N. by the German Ocean and the Straits of Dover; N.W. by the English Channel; W. by the Atlantic, more especially that part of it called the Bay of Biscay; S. by Spain and the Mediterranean Sea; E. by Italy, Switzerland, and the German territory of Alsace; N.E. by German Lorraine, Luxemburg, and Belgium. The longest lines which can be drawn across France are two diagonals, which intersect each other—the one from the south-east to the north-west extremities, 670 miles, and the other, from the south-west to the north-east extremities, 555 miles. Measured on the meridian of Dunkirk, the greatest length is 600 miles, and measured on the parallel of 48° 20′, the greatest breadth is 547 miles. The breadth near the centre is 400 miles, and along the parallel of 46° 15′, where it is narrowest, does not exceed 340 miles. The total area of France is 204,090 square miles. On taking a survey of this great country it is impossible not to be struck with the advantages it derives from its position. It not only forms a continuous and compact whole, but while protected by great natural barriers at most parts where it is connected with the continent, a long line of coast on the west and north-west gives it immediate access to the great ocean thoroughfare, while on the south its harbours in the Mediterranean secure to it a large share in the traffic of that most important of all inland seas.

Physical Features—Mountains, Rivers, and Lakes.—France is traversed from south-west to north-east by several chains of mountains forming the general water-shed of the country. This water-shed has two slopes, the one towards the west and north, carrying its waters to the Bay of Biscay, the Atlantic Ocean, the English Channel and the German Ocean; the other towards the east and south, carrying its waters to the Mediterranean. The ranges of mountains and hills forming this water-shed include the western and central Pyrenees, the western Corbières in the department of Aude, the Cevennes, the mountains of Vivarais, Lyonnais, Beaujolais, and Charollais, the Côte d'Or, the Plateau de Langres, the Faucilles Mountains, and the Vosges. This general water-shed is met towards the north-east by the eastern mountain ranges of France, namely, the Jura range and various Alpine ranges, one of the peaks of which is Mont Blanc, which may be regarded as the culminating point of the European mountains, although not absolutely the highest mountain in Europe. Near the centre of France, and separate from the great water-shed of the country, are several groups of volcanic mountains known by the general name of the Mountains of Auvergne, the chief peaks of which are the Plomb du Cantal in the southernmost group, the Puy de Sancy in the central group, and the Puy de Dôme in the northernmost group.

The spurs thrown off by the great water-shed divide France into six principal basins, five of which are on the north-western slope, and one on the south-eastern. These are:—1. The basin of the Garonne and its affluents (the Ariége, Tarn, Lot, and Dordogne on the right bank, and the Gers on the left bank). To this principal basin belong also the two secondary basins of the Charente on the north, and the Adour on the south. 2. To the north of the basin of the Garonne is that of the Loire and its tributaries (the Nièvre and the Maine on the right bank, and the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). To this basin also belong the secondary basins of the Vilaine and the Blavet. 3. The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right bank, and the Yonne, Loing, Eure, and Rille on the left bank). The secondary basins are that of the Somme in the north, and those of the Orne and Oise in the south. 4. The basin of the Meuse and its tributaries (the Sambre on its left bank), to which is added the secondary basin of the Escaut or Schelde. Only the southern portion of these two basins is included within the political boundaries of France. 5. The basin which pours a number of

tributaries, the principal of which is the Moselle, into the Rhine. Only a comparatively small portion of this basin also is included within the political boundaries of France. 6. The basin of the Rhône, occupying the whole of the territory of France which lies to the south-east of the great water-shed. The tributaries of the Rhône are the Ain, the Saône, the Ardèche, and the Gard upon the right bank, and the Isère, Drôme, and Durance on the left. Only the lower part of the course of the Rhône is in France. The secondary basins are those of the Var, Argens, and Arc on the east, and those of the Tet, Aude, and Hérault on the west. France has in all more than 212 navigable streams, with a total navigation of 5700 miles.

The lakes are so few in number, and individually so limited in extent, as to be undeserving of separate notice. The largest, Grand-Lieu, in the department of Loire-Inférieure, covers an area of only 27 square miles, and is altogether devoid of interest. The next largest, St. Point, in the Jura, does not cover 3 square miles. Others of still less dimensions become more interesting from their localities in the lofty regions of the Pyrenees, or in the deep hollows of ancient craters in Auvergne.

Geology.—As might be anticipated from the extent of space which it occupies, France possesses all the geological formations in a greater or less degree of development. The mountains generally have a nucleus of granite, which accordingly forms a prevailing rock in the Alps, on the east frontier, and their branches south to the shores of the Mediterranean, in the Pyrenees, the Cevennes, and the elevated plateau of Langres. In the Vosges it is more sparingly developed, its place being often occupied by porphyry; and in the Jura, where limestone occurs in such enormous masses as to have given its name to a peculiar formation, it does not appear at all *in situ;* but, on the other hand, almost the whole of the extensive peninsula, including the old province of Brittany and part of those of Normandy and Poitou, is covered by it. The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still presented to the eye in extinct craters and lava streams. The granite is overlaid by primitive stratified rocks of gneiss, and of micaceous and argillaceous slates, succeeded, particularly in the Pyrenees, by mountain limestone, which there assumes a form worthy of the name, and is found on Mont Perdu, full of its characteristic fossil shells, at the height of 10,230 feet above the level of the sea. The secondary formation, commencing with this limestone and continued in ascending series up to the chalk, always possesses peculiar interest, because within it valuable mines of lead and iron, and all the workable seams of coal, are included. It is largely developed in many parts of France, and furnishes a considerable number of coal and mineral fields, to which more particular reference will afterwards be made. The tertiary formation, including all the limestones, sands, and clays, above the chalk, occurs continuously in two great divisions, and partially in a number of isolated spots, and covers a vast extent of surface. The larger continuous division is in the south-west, where it commences at the foot of the Pyrenees, and occupies a very large portion of the basins of the Garonne and of the Adour. The lesser, but better known division, takes the name of the Paris basin, and has been made familiar to the scientific world by the labours of Cuvier and other distinguished naturalists. It occupies a large extent of space around Paris, and stretches south into the valley of the Loire. A considerable stretch of the same formation is found in the basin of the Rhône, particularly along the east bank both of that river and its tributary the Saône. Of more recent alluvial formations, the only one particularly deserving of notice is the delta of the Rhône.

Climate.—The climate of France is greatly diversified, and cannot be described accurately without dividing it into different regions. But before mentioning these, it may be proper to observe, in general, that no country in Europe can boast of a climate superior to that of France. With a very limited exception, it lies wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°; and, consequently, with a mean annual temperature, the difference of which, at its north and south extremities, does not exceed 10°. France may be divided into four climatic regions according to the different vegetable products which different districts are able to mature. Within the first, and warmest, the olive is successfully cultivated. It forms the south-east part of France, and is chiefly confined to the departments which border on the Mediterranean. The second region is characterized by the general cultivation of maize or Indian-corn. Its north limit is determined by a line drawn diagonally in a N.N.E. direction, from the department of Gironde to that of the Vosges. The third region reaches north to the extreme limit of the profitable culture of the vine, and may be considered as determined by a line stretching between the mouth of the Loire and the town of Mézières, in the department of Ardennes. All the country beyond this line is included in the fourth region. All of these regions, notwithstanding their diversities of temperature, are generally healthy. In the north-west the prevalence of winds from that direction often produces a superfluity of moisture, which manifests itself in mists or in frequent and heavy showers of rain. At the opposite extremity, the south-east, a contrary effect is produced, and a sultry, stifling wind wrinkles up the skin, and not unfrequently spreads fever in its most malignant form. But it is only to a few exceptional districts that these remarks apply. After allowing for them, more than four-fifths of the surface remains, under an atmosphere remarkable, more especially in its central districts, for salubrity, serenity, and brightness.

Political Divisions.—Before the revolution of 1789 France was divided into general governments, or provinces, as they are usually called, although by some writers this latter term is reserved for the ancient feudal territories into which France was divided in the middle ages. The number of these general governments has varied at different epochs. Under Francis I., by whom they were instituted, there were nine, namely, Normandie, Guyenne, Languedoc, Provence, Dauphiné, Bourgogne, Champagne-et-Brie, Picardie, Ile-de-France. Under Henry III. there were twelve, formed by the addition of Bretagne, Orléanais, and Lyonnais. Under Louis XIV. the number was fixed at thirty-two, to which a thirty-third was added by the acquisition of Corsica, under Louis XV. In 1789, when the love of change became paramount, the provinces were not permitted to escape; and it was then determined that the whole of France, including the island of Corsica, should be parcelled out into departments, and each department subdivided successively into arrondissements, cantons, and communes, an arrangement which was actually carried out in 1790. This division has since maintained its ground, and perhaps deserves it, because, instead of being merely an artificial nomenclature, it has the merit of being a kind of natural classification—each department being named after the most important physical feature which it contains; and thus furnishing, in the name, some know-

ledge of the space which it designates. The number of departments was originally eighty-three, but it has been at different times increased and decreased. There are now eighty-six departments, in addition to the district of Belfort. As the old provinces, though no longer recognized in legal and other formal documents, continue so familiar to the French themselves, and are so frequently mentioned, not only by earlier writers, but in the geographical, historical, and statistical works of the present day, a table is here given exhibiting these provinces in alphabetical order, and in parallel columns, the chief town in each, and the departments most nearly corresponding to them:—

Provinces.	Departments.	Capitals of Provinces.
Alsace,	(Now German territory, except the district of Belfort),	Strasbourg.
Anjou,	Maine-et-Loire,	Angers.
Artois,	Inland or south-eastern portion of Pas-de-Calais,	Arras.
Aunis,	Maritime part of Charente-Inférieure,	La Rochelle.
Auvergne,	Puy-de-Dôme and Cantal,	Clermont.
Béarn-et-Navarre,	Basses-Pyrénées,	Pau.
Berry,	Cher, Indre,	Bourges.
Bourbonnais,	Allier,	Moulins.
Bourgogne,	Ain, Côte-d'Or, Saône-et-Loire, Yonne,	Dijon.
Bretagne,	Côtes-du-Nord, Finistère, Ille-et-Vilaine, Loire-Inférieure, Morbihan,	Rennes.
Champagne,	Ardennes, Aube, Marne, Haute-Marne,	Troyes.
Corsica,	Corse,	Ajaccio.
Dauphiné,	Hautes-Alpes, Drôme, Isère,	Grenoble.
Flandre,	Nord,	Lille.
Foix,	Ariége,	Foix.
Franche Comté,	Doubs, Jura, Haute-Saône,	Besançon.
Gascogne-et-Guyenne,	Aveyron, Dordogne, Gers, Gironde, Lot, Lot-et-Garonne, Landes, Hautes-Pyrénées, Tarn-et-Garonne,	Bordeaux.
Ile de France,	Oise, Seine, Seine-et-Oise, Seine-et-Marne, southern part of Aisne,	Paris.
Languedoc,	Ardèche, Aude, Gard, Hérault, Haute-Garonne, Haute-Loire, Lozère, Tarn,	Toulouse.
Limousin,	Corrèze, Haute-Vienne,	Limoges.
Lorraine,	Meuse, Vosges, Meurthe-Moselle (and German Lorraine),	Nancy.
Lyonnais,	Loire, Rhône,	Lyon.
Maine,	Mayenne, Sarthe,	Le Mans.
Marche,	Creuse,	Guéret.
Nivernais,	Nièvre,	Nevers.
Normandie,	Calvados, Eure, Manche, Orne, Seine-Inférieure,	Rouen.
Orléanais,	Eure-et-Loir, Loiret, Loir-et-Cher,	Orléans.
Picardie,	Somme, maritime part of Pas-de-Calais, N. part of Aisne,	Amiens.
Poitou,	Deux-Sèvres, Vendée, Vienne,	Poitiers.
Provence,	Basses-Alpes, Bouches-du-Rhône, Var, eastern part of Vaucluse,	Aix.
Roussillon,	Pyrénées-Orientales,	Perpignan.
Saintonge and Angoumois,	Charente and eastern or inland part of Charente-Inf.,	Angoulême.
Touraine,	Indre-et-Loire,	Tours.

The following territories have been acquired since 1790:—

Territories.	Departments.
Avignon and Venaissin (including Orange previously acquired),	Part of Vaucluse.
Nice,	Alpes-Maritimes.
Savoie,	Savoie, Haute-Savoie.

Agriculture, &c.—About four-fifths of the soil of France is productive, and about one-half of the whole French territory is under the plough. To secure the productiveness of the land thus occupied, it has been seen that nothing is wanting to the climate; and the soil, taken as a whole, is of at least medium fertility. In regard to the management of arable land, the French cannot claim much praise. While everything else has been undergoing rapid change, the system of agriculture has remained almost stationary. All the advances that have been made have been scattered and local. Owing to many causes the quantity of land taken into cultivation has been enlarged, and the annual produce has increased, but it is very doubtful if this increase has been obtained by improved modes of agriculture. On the contrary, the most antiquated routine continues to be followed, the implements used are generally of an inferior description, and the large farming establishments for which our own country is distinguished, and in which all the improvements which science and art can furnish to maintain the fertility of the soil, increase the quantity, and improve the quality of its produce, are here even of much rarer occurrence than on many other parts of the Continent. One great cause of this state of matters is the almost endless subdivision of property, which necessarily results from the French law of succession, by which all children inherit equally. The ordinary cereals form the great bulk of the cultivated crops. In France these, in the order of their importance, are wheat, oats, rye, and barley. The crops next in importance to these are meslin or mixed corn (*meteil*), potatoes, hemp, rape, maize, buckwheat, flax, and beet. This last plant is cultivated pretty extensively in some departments, especially in that of Nord, for the manufacture of sugar. The most valuable crops of which the cultivation on a great scale is not general, but confined to particular districts, are madder, tobacco, saffron, and hops. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. The total estimated revenue from the sale of tobacco for 1873 amounted to 287,270,000 francs (£11,490,000), but as the cost of cultivation is about 60,000,000 francs (£2,400,000), the net revenue would amount to about £9,090,000. In France the grass is on a much more limited scale than the arable husbandry, the land in permanent meadow being in extent only one-sixth of that under the plough. This contrasts strikingly with England, where the grass land exceeds the arable. The breeding of stock, notwithstanding the stimulus afforded by the establishment of numerous societies, general and local, for its encouragement, is, in France, if not imperfectly understood, very indifferently practised. The races of oxen, instead of being confined to a few of the more perfect types, are almost as various as the different districts into which the country is divided, and include a few good breeds, particularly in the rich plains of Lower Normandy, with many more of the most inferior description. The rearing of sheep is more successful, and though the improvement of the carcass, by imparting to it the best feeding properties, continues to be too much overlooked, the fleece has in many districts been carefully and skilfully improved, and much wool, scarcely inferior to that of the merino, is raised. The general employment of cattle for agricultural purposes gives little encouragement to the rearing of draught horses; but the warlike propensities of the nation have always created an extensive demand for horses of a description adapted both for heavy and light cavalry. Considerable pains have been taken to improve such breeds, by the establishment of government studs, and the rearing of them is extensively and successfully carried on. Asses and mules, generally of a superior description, are much used in France, and also reared in considerable numbers for exportation.

The cultivation of the vine is one of the most important branches of French agriculture. The total quantity of land in vineyards is nearly a twenty-fifth of the whole surface; but as there are extensive and continuous districts where there are no vineyards, the proportion which vine-land on the districts properly

adapted to it bears to the whole land under cultivation, attains a much higher ratio. There are seventy-five departments in which the vine is cultivated more or less, but three-fourths of the production are obtained from about thirty departments. In everything relating to this branch of culture the French are unsurpassed. The various first-class wines which they produce, under the names of Champagne, Burgundy, Bordeaux, &c., are in high repute and general demand over all Europe. The departments in which the greatest extent of land is occupied by vineyards are the Gironde, Charente-Inférieure, Hérault, Charente, Dordogne, Gers, Gard, Lot-et-Garonne, and Var; but the departments of Marne and Aube, forming the ancient province of Champagne, and those of Côte-d'Or and Saône-et-Loire, comprised in Burgundy, though yielding a less quantity of wine than others, are highly distinguished for the superior quality of their products. Gironde furnishes the wines properly understood by the name of *claret*. A fifth part of the Bordelais wines is used for the distillation of brandy; but they are inferior for this purpose to those of the Charente, which supply the famous Cognac brandy. In the year 1872 France exported to Great Britain 5,108,819 gallons of wine, of the declared value of £2,727,137. A large part of the wealth of France consists in its fruits. Among the most important fruit-trees cultivated in France are the apple, the fruit of which, in the northern districts, particularly in Normandy, is largely used for the manufacture of cider; the chestnut, which, in the somewhat barren districts of Central France (Limousin, Cevennes, Auvergne, Périgord, Vivarais), yields an article of food which takes the place of the cereals among the poorer classes; the mulberry-tree, cultivated in eight or ten departments in the south-east (especially in Gard and Ardèche), both for its fruit and its leaves, the leaves being used as food for the silkworms, on which the French silk manufacture depends; the olive, which grows in the same districts as the mulberry, but is principally cultivated in the department of Var; the pear, plum, cherry, apricot, peach, orange, citron, fig, almond, &c.

The forests of France occupy about one-seventh part of the whole territory. Their principal localities are the Ardennes, Vosges, and Plateau de Langres, in the north-east; the Jura in the east; and the mountains of Auvergne in the centre. The two loftiest of the French mountain-ranges, the Alps and the Pyrenees, are comparatively poor in wood. Isolated forests exist in various other quarters, as at Compiègne, Villers-Coterêts, Halatte, Chantilly, Fontainebleau, the mouth of the Seine, and in the Landes along the Bay of Biscay. In the last mentioned locality a forest of sea-pine, about 100 miles long by 7 miles broad, has been found, which not only furnishes good timber, &c., but serves the important purpose of protecting a large tract from clouds and whirlwinds of sand, which must soon have converted it into a desert. The chief constituents of French forests are the oak, the elm, the pine, the fir, the larch, the birch, the beech. The total estimated revenue from forests for 1873 amounted to 42,022,500 francs (£1,680,900), and the net revenue to 30,317,503 francs (£1,212,700).

Minerals.—The coal-fields of France are so numerous that coal-pits exist in no fewer than thirty-three departments; but most of these are very limited in extent. Several of the smaller fields occur in the north-west, and also in the south, where both anthracite and lignite are found; but the fields whose importance entitle them to particular notice are only two—that of Valenciennes in the north-east, forming the western extremity of the great Belgian coal-field, and that of St. Étienne, to which the manufactures of that town, Lyons, and the surrounding districts, are indebted for much of their prosperity. The annual output is about 12,360,000 tons, but falls so far short of the annual consumption, that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal-fields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast-furnaces; but the chief supply to these works appears to be derived not from them, but partly from alluvial beds, in which the ore occurs in the form of balls, especially in the departments of Ardennes, Moselle, Haute-Marne, Haute-Saône, Nièvre, Cher, &c., partly from seams occurring in profusion among the strata of the Jura limestone, particularly on the western slope of that mountain chain, and partly from the veins of iron diffused among the crystalline and primitive rocks, chiefly of the Alps, Pyrenees, and Vosges. The number of mines actually worked is about 2000, and the quantity of foundry pig annually produced exceeds 1,000,000 tons. Few countries are understood to be so rich in lead as France. It occurs in greater or less quantity in a great number of districts, and is generally argentiferous. It would seem, however, that the richness of the seams is not in proportion to their number, as the working of it is confined to three particular spots—Poullaouen and Huelgoat in the department of Finistère; Vialas, in the department of Lozère; and Pontgibaud, in the department of Puy-de-Dôme. Manganese is very widely diffused, but is worked only by twelve mines, of which the most important is that of Romanéche, department Saône-et-Loire. Gold exists both in the sands of rivers and *in situ* in thin streaks embedded in quartz. Attempts have been made to work it, but not with success. A vein of quicksilver was opened about the middle of the last century, and was worked successfully for twelve years, and then abandoned. Zinc, copper, arsenic, nickel, and cobalt exist, but not in such quantities as to be workable to profit. The principal saline substances are alum and common salt. The former occurs extensively in bituminous schists abounding with iron pyrites, and is worked in seven departments; the latter occurs in the form of rock-salt, both in the N.E. departments and in the Pyrenees, and is worked to the average extent annually of about 43,000 tons. But the great sources from which salt is derived are the lagoons and salt marshes which line many parts of the coast. Of these the produce is about 300,000 tons. A large revenue is also derived from quarries, and valuable beds of common clay, fine potter's earth, and kaolin.

Manufactures.—The most important tissue is silk, which, in a great variety of forms, plain and figured, has its principal locality at Lyons and the towns of the surrounding districts, particularly St. Étienne, and is also successfully manufactured, though to an inferior extent, at Paris, Nîmes, Avignon, Annonay, and Tours. The declared value of the silk manufactured goods exported to the United Kingdom in 1870 was £10,914,010; in 1871, £4,836,365; and in 1872, £6,547,673. After it, though at a considerable distance, follow cotton stuffs, pure and mixed, at Rouen, St. Quentin, Troyes, Lille, &c.; woollens, including broad-cloths, at Louviers, Elbeuf, Sédan, Carcassone, Abbeville, &c.; lighter woollen stuffs at Rheims, Amiens, and Beauvais; carpets at Paris, Aubusson, Felletin, and Abbeville; and tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace, at Valenciennes, Courtray, St. Quentin, Alençon, Caen, &c.; porcelain at Sèvres, Paris, Limoges, and Bayeux; stoneware at Nevers, Monterau, &c.; and common pottery at Paris, Nevers,

and Meillonas; beet-root sugar, chiefly in the department of Nord; leather, and the various articles made of it, including gloves; paper, plain and stained; hats, hosiery, steel, iron, brass and zinc ware, plate and flint glass, &c. Besides these, a great number of articles in which skill, taste, and ingenuity are more especially required, have their common seat in the capital. Among others may be mentioned all articles of vertu, jewelry, clocks and watches, surgical and mathematical instruments, carriages, works in ivory, types, books, and engravings.

Commerce and Shipping.—The commerce is usually divided into internal and external. The former is unquestionably the larger of the two, but its amount cannot be ascertained with any degree of exactness. The principal towns of the interior, constituting the centres from which it emanates, are Paris, Lyons, Rouen, Lille, St. Étienne, Toulouse, Nîmes, Nancy, and Perpignan. In 1871 the imports for home consumption, exclusive of the precious metals, amounted to £135,728,000; and in 1872, to £137,896,000; the exports of native products and manufactures amounted in 1871 to £114,624,000; and in 1872, to £147,156,000. The following table shows the value of the chief imports and exports in 1872:—

Imports.	
Silk and floss silk	£16,732,000
Wool	12,460,000
Cotton	8,104,000
Cattle	7,008,000
Grain	6,704,000
Raw hides and furs	5,400,000
Timber	5,182,000
Coal	5,148,000
Exports.	
Silk stuffs	£19,520,000
Woollen goods	11,620,000
Grain and Flour	10,568,000
Leather and leather goods	9,008,000
Haberdashery	5 872,000
Silk	5,300,000
Refined sugar	4,716,000
Confectionery	4,292,000

In 1872 the merchant navy of France included 4799 sailing vessels of above 60 tons burden with a total tonnage of 902,096 tons, and 316 steamers above 60 horse-power, with a tonnage of 240,273 tons. The total number of vessels, native and foreign, entered and cleared at French ports in 1871 was 3998, of 799,596 tons burden.

Canals, Roads, Railways, Post-office, &c.—The canals are numerous, and both in the directions which have been given to them, and in their general construction, furnish signal displays of engineering skill. The object has been to connect all the great river basins, and give a continuous communication throughout the interior, and from sea to sea. Thus the Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an E.S.E. direction into the lagoon of Thau, and thereby gives a continued navigable communication between the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassone, and Narbonne. In like manner three separate canals cut across the basin of the Rhône; the Canal du Centre, or of Charollais, which commences at Châlons-sur-Saône, and proceeds to Digoin, on the Loire; the Rhône and Rhine Canal, so called from uniting these two rivers, partly by the intervention of the Doubs; and the Canal of Burgogne, which, proceeding also from the Saône, communicates with the Yonne, and through it with the Seine. The effect of these three canals is to break down the barriers which isolate the basins of the Rhône, Loire, Seine, and Rhine, and give navigable access from any one of them into the other three. The roads of France are usually classified under the heads of Great Roads (*routes royales*) and Department Roads. Besides these, there are a great number of country or district roads (*chemins vicinaux*), the length of which is unknown. All the railways in France are granted to private companies for only a limited period, at the end of which they become state property. According to the report of the commission on railways appointed by the National Assembly, there were in France on the 1st of June, 1873, 11,328 miles of railway in operation, 1864 miles in course of construction, 731 miles about to be commenced, and 345 miles conceded by the state. Up to January 1, 1873, the total cost of construction of French railways amounted to £358,760,000, of which £317,560,000 was borne by the private companies, and £41,200,000 by the state. In 1871 the total number of letters, book-packets, &c., delivered in France was 539,744,000. The net revenue derived from the post-office in the same year was £975,133. The total length of telegraph lines in France in 1871 was 27,225 miles, and of wires 76,215 miles. The total number of messages despatched in the interior in the same year was 4,371,932; despatched to foreign countries, 765,356; received from foreign countries, 772,411; in all, 5,909,699.

Administration of Justice.—In accordance with the general arrangement which divides the whole country into departments, each department into arrondissements, each arrondissement into cantons, and each canton into communes—a series of courts and judges, commencing with the lowest of these divisions, rise above each other in regular order. First, each commune has a justice of peace (*juge de paix*), who judges in petty causes, but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. If the attempt at conciliation fails, the complainant brings his action before a court which, from being that in which the action must originate, receives the name of court of primary or first jurisdiction or resort (*tribunal de première instance*). Every arrondissement has such a court, and has, moreover, if any more important trading town is situated within it, a *tribunal de commerce*, to which mercantile and commercial causes are appropriated. It has also, occasionally, a court called *conseil de prud'hommes*, in which persons of skill and character, not vested with ordinary legal functions, settle disputes on principles of equity, and apparently in the character of arbitrators. From these courts of primary resort an appeal lies to a number of courts, which used to be called *cours royales*. They are in all twenty-seven, have each jurisdiction over several departments, and are ranged into three classes, namely, two courts composed of five, nine courts composed of four, and sixteen courts composed of three chambers. These courts generally hold their sittings in the most important town situated within their jurisdiction. Above all these courts, and properly the only supreme court of the state, is the *cour de cassation*, so called from its power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Instruction and Public Worship.—In France education in all its branches has long been taken under the special cognizance of the state, and the superintendence of it is expressly committed to a high functionary, who takes the name of minister of public instruction and religious worship (*des Cultes*). The principal educational establishments are classed under

three heads—primary, secondary, and academical or superior. At the head, and as centre of the whole, stands the university. The minister of public instruction is considered its grand-master, and, with a council composed of thirty members, exercises a universal educational jurisdiction over all France. For this purpose the jurisdiction of the university is divided into twenty-seven *circonscriptions*, each of which has the name of *académie universitaire* of the chief place within its district. Thus, for instance, the one which includes the three departments of Charente, Dordogne, and Gironde, is called the *académie universitaire* of Bordeaux. At these establishments the education given is of the highest professional description, and need not be particularized. Secondary instruction comprehends moral and religious instruction, ancient and modern languages, philosophy, history, geography, mathematical and physical science. This education is given chiefly in colleges. Primary instruction is intended for the whole population, with a few unimportant exceptions. It comprehends moral and religious instruction, reading, writing, the elements of the French language and of arithmetic. Religion, in like manner, is taken under the cognizance of the state, and falls within the province of the high functionary already mentioned, who adds to his designation of minister of public instruction that of minister *des Cultes*. Here, however, his power of interference is much circumscribed; for while the state declares that the Roman Catholic is the religion of the majority, it does not establish it, but, on the contrary, places all forms of religion on an equal footing, and professes to deal impartially with all by paying salaries to their ministers. To the Roman Catholics the allowances have amounted to about £2,000,000 annually, and those to Protestants about £150,000. With the quality of the particular religion, therefore, the state concerns itself no further than simply to know that it is not obviously subversive of social order or good morals.

Army.—By the law of the 18th of August, 1872, personal military service is declared to be obligatory upon all Frenchmen. Every Frenchman who is not pronounced unfit for military service must serve, first in the regular army (*armée active*) for five years, then in the reserve of the regular army for four years, next in the territorial army for five years, and finally in the reserve of the territorial army for six years. By the law of the 24th of July, 1873, referring to the organization of the army, the territory of France is divided into eighteen regions, each of which is again subdivided. Each region is occupied by a *corps d'armée*, and there is also a corps d'armée assigned to Algeria. Each region has general stores, and each subdivision has one or more special stores supplied from the general ones. Each subdivision has one or more recruiting centres. Each corps d'armée comprises two divisions of infantry, one brigade of cavalry, one brigade of artillery, one battalion of engineers, and one squadron of the train of military equipages. The permanent and paid part of the territorial army consists only of those necessary to its administration, to the keeping of the army registers, accounts, &c., and to calling out the army for active service. When called out for active service the corps of the territorial army may be assigned to garrison fortresses, to hold military posts, to defend the coasts, &c., or they may even be detached to form part of the armée active. According to the law of 24th July the French forces may be estimated as follows:—

Armée active	795,000
Reserve of armée active	510,000
Territorial army	600,000
Reserve of territorial army	600,000
Total	2,505,000

Navy.—According to the provisions of the budget of 1873 the French navy consists of 94 ships fully equipped (8 armour-plated and 86 without armour), and 62 training-ships, service-ships, &c. (19 armour-plated and 43 without armour), with a total complement of 28,431 men. But after the plan for the conversion of the fleet has been carried out, it will consist of 12 armour-plated vessels of the first class, 12 armour-plated vessels of the second class, 20 armour-plated gun-boats, 8 frigates, 8 corvettes, 38 despatch-boats, 25 transports, and 32 gunboats without armour, besides training-ships, &c.

National Debt.—According to the budget of 1873 this included a consolidated debt amounting to £631,481,441, and a redeemable debt (including annuities) amounting to £278,760,000 — in all £910,214,441. The total interest on the debt amounted in 1873 to £39,360,996.

Constitution.—Since the overthrow of the second empire by a Parisian mob on the 4th of September, 1870, there has been no regular constitution in France. The head of the government at present bears the title of President of the Republic, and the legislative body is a National Assembly, consisting of 738 members, elected on the 8th of February and the 2d of July, 1871.

Weights, Measures, and Money.—As an account of the present system of weights, measures, and moneys in France is contained in the article DECIMAL SYSTEM, all that is necessary here is to give some information regarding the weights, &c., formerly in use. The old measures of length were:—The *toise* or fathom of France equal to 6 Parisian feet, the foot to 12 inches French, and the inch to 12 lines, each subdivided into 12 points. 76 Parisian feet are nearly equal to 81 English feet, or, more accurately, 40,000 Parisian feet, inches, or lines, equal 42,630 English feet, inches, or lines. Thus 1 Parisian foot equals 1·065765 English, or 12·78918 English inches, so that the toise is equal to 6·39 English feet. Hence also 1 English foot equals 11·26 French inches. The Paris *aune* was 46·78 English inches. In the old French road-measure the term *lieue*, or league, was applied to three principal measures. The first was the legal or posting league, which was equal to 2 French miles, each mile 1000 toises, hence equal to 2 English miles 3 furlongs and 15 poles. The second is the marine league (20 to a degree), equal to 2853 toises or 6076 English yards. And the third is the astronomical league (25 to a degree), equal to 4860 English yards. The *arpent*, or acre of land, contained in general 100 square *perches;* but the perche varied in different provinces. The Paris arpent contained 900 square toises, and the royal arpent 1544 square toises. The old French weight for gold and silver, called *poids de marc*, makes the pound or livre contain 2 *marcs*, 16 *onces*, 128 *gros*, 384 *deniers*, or 9216 *grains*, equal to 7500 grains troy. The French marc = 3750 grains troy. For commercial weight the poids de marc was likewise used, and the *quintal* of 100 livres = 108 lbs. avoirdupois very nearly. Weights and measures, however, varied considerably in the different provinces. Corn measure was the *muid* of 12 *setiers*, 24 *mines*, 48 *minots*, or 144 *boisseaux* The muid was of different weight, according to the grain measured, and the other weights varied with it. Thus for barley and wheat it was 1875 litres; for oats, 3746 litres; for salt, 2497 litres, &c. Wine measure was the muid of 36 setiers, 144 *quartes*, or 288 *pintes*. For liquid measure the muid was equal to 268 litres. See DECIMAL SYSTEM.

The unit of the old French money system was the livre. Before 1667 there were two livres coined. The one was the *livre tournois*, so called because it was struck at Tours. It was divided into 20 *sous*,

and each sou into 4 *liards* or 12 *deniers*. In the year mentioned the use of this livre was rendered general throughout the kingdom. The other was the *livre parisis*, equal in value to 25 *sous tournois*, but nevertheless divided in the same way as the latter. This was suppressed at the same time that the use of the other was made general. The livre tournois remained the monetary unit in France till the introduction of the decimal system in 1795. At that period the value of the livre was very nearly equal to that of the franc, which then came into use, 1 livre being equal to 0·98765 francs, or 81 livres about equal to 80 francs. On that account the two were frequently confounded with one another, the terms franc and livre being used indifferently to express any sum of money. Before 1795 the following multiples of the livre were also in use: the *louis d'or* = 24 livres; the *pistole* = 10 livres; the large crown (*gros écu*) = 6 livres; the small crown (*petit écu*) = 3 livres.

A number of the denominations properly belonging to the old systems of weights, measures, &c., are still used in France, and applied to values derived from the decimal system. For example, a millimètre is sometimes called a *trait* or line, a *decamètre* a *perche*, and the third of a mètre is called a *pied usuel*. Similarly in the square measure a *hectare* is sometimes called an *arpent;* and in the liquid measure the *hectolitre* sometimes receives the name of *setier*, and the *kilolitre* that of *muid*. For distinction's sake such old denominations, when used in a modern sense, are usually qualified by the adjective *metrique*.

Extent of Empire.—In addition to the territory it occupies in Europe, France possesses Algeria, besides various colonies and protected states in Asia, Oceania, America, and elsewhere. These, with their area and population according to the most recent returns, are exhibited in the following table:—

	Area in sq. miles.	Population.
1.—France and Algeria.		
France (census of 1872)	204,090	36,102,921
Algeria (census of 1872)	258,318	2,414,218
2.—Colonies.		
In India (Pondichéry, Karikal, Mahé, Yanaon, Chandernagore)	196	259,981
French Cochin-China	21,710	1,204,287
New Caledonia	6,718	29,000
Loyalty Islands	829	15,000
Marquesas Islands	480	10,000
Senegambia	?	?
Isle of Réunion	970	209,737
Isles of Mayotte and Nossi-Bé	207	16,000
Isle of Ste. Marie	67	5,979
St. Pierre et Miquelon	81	3,971
Martinique	381	153,334
Guadeloupe and dependencies	635	152,910
French Guiana	35,080	25,151
3.—Protected States.		
Kingdom of Cambodia	32,380	1,000,000
Islands of Tahiti, Moorea, Tetouaroa, and Maitea	450	13,847
Islands of Toubonai, Vavitou, and Rapa	56	675
Touamotou Islands	2,934	8,000
Gambier Islands	12	1,500
Total	81,280	41,626,511

History.—France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by three or four hundred independent tribes, divided into three great families, the Celts or Gauls, the Iberians or Vasconians, and the Belgæ. The Iberians appear to have been the earliest settlers, and to have entered the country by way of Africa and Spain. Before the arrival of the Celts it is probable that the Iberian tribes had spread a considerable distance northwards into the heart of France, but they were gradually driven southwards by the new settlers, until at the time of Julius Cæsar they occupied, under the name of Aquitanians (Aquitani), only the south-western portion of Gaul lying between the Pyrenees and the river Garonne (Garumna). It was these people who gave their name to two of the great provinces of south-western France, Aquitaine or Guyenne (Aquitania) and Gascony (Vasconia); and it is their descendants who still inhabit the Basque provinces in the north of Spain, and speak a language (the Basque) which has no discoverable affinities with any other human tongue. The Belgæ appear to have been the latest settlers in Gaul. They inhabited the northern part, and were separated from the Galli by the rivers Seine and Marne. Besides these three races, who occupied extensive tracts of territory in Gaul, there were other two peoples who, long before the Roman period, made local settlements in the parts adjoining the Mediterranean. These were the Phœnicians and the Greeks, both of whom had commercial objects in view. The Phœnicians came first and planted some colonies in the interior, in the valley of the Rhône; but they were ultimately supplanted by the Greeks. Some Rhodian colonists established themselves at the mouths of the Rhône, while the Phœnician colonies in the interior fell into the hands of the natives. About 600 B.C. a body of Phocæans founded the most celebrated of the Greek colonies in all Gaul, to which they gave the name of Massilia, now Marseilles. When Rome grew in power the Greeks of Massilia, animated by jealousy and fear of Carthage, became the allies of the Romans, and it was in aid of these allies, against whom the neighbouring tribes of Gaul had risen, that the first Roman expedition was sent into Gaul beyond the Alps (Gallia Transalpina). This was in 154 B.C., when the Romans, after subduing the insurrectionary tribes, handed over their territory to the Massilians. When the Romans were again called in to aid their Greek allies in Gaul (125 B.C.) the territory which they subjugated was retained by them, and erected into a Roman province. The first Roman settlement was Aquæ Sextiæ (now Aix), which was founded in 122 B.C., and their power was to some extent secured by the foundation, in a favourable situation, of the colony of Narbo Marcius (Narbonne), B.C. 118. This Roman territory in the south-east of Gaul was long known simply as Provincia, whence the modern Provence. Not long after coming into the possession of the Romans this province was in danger of being wrested from them by vast hordes who came from the eastern side of the Rhine and inundated Gaul. Ancient writers give the names of Cimbri and Teutones to these invaders, but there is so little else known concerning them that it cannot even be determined whether they were one or two peoples. Having reached the banks of the Rhône they routed five Roman armies in succession, and had they then crossed the Alps might have imperilled the safety of Rome itself. Fortunately, however, they turned their course to the Pyrenees, and before they returned Marius was ready with another army to defend the Roman province. A battle took place at Aix in B.C. 102, in which the barbarian hordes were totally defeated, and another detachment who had made their way into northern Italy met with the same fate in the year following. From that year till B.C. 58, when Cæsar obtained the Roman province in Gaul as his proconsular province, there was comparatively little change in Gaul; but no sooner did Cæsar appear than one pretext after another was found for gradually subduing the whole of Gaul. The conquest was completed between the years 58 and 51 B.C. (Cæsar's authority in Gaul having previously been renewed for another term of five years). Under Augustus the whole territory was divided into four provinces: Gallia Narbonensis, the former Provincia, now called

Narbonensis from the town of Narbo; Aquitania, now extended to the Liger (Loire); Gallia Lugdunensis, from Lugdunum (Lyons), a colony at that time newly planted; and Gallia Belgica, including the modern Belgium, as well as all that part of what is now called France which lay to the north of the Seine and the Marne (Sequana and Matrona). The whole country was then divided into sixty municipal districts, each of which was administered by a Roman colonial city, or *municipium*. The chief seat of the government of the whole of Gaul was the colony of Lugdunum. This administrative division of Gaul under the Romans subsisted till the fourth century, when a new division was made of this portion of the empire into seventeen provinces and 120 municipal districts; and the city of Lugdunum was now overshadowed by a newer colony (Trèves), planted on the banks of the Moselle in the midst of the Treviri. In A.D. 365 another important change was made in the administration of Gaul by the institution, by Valentinian I., in all the municipia, of tribunes, a class of officers who were designed to guard the interests of the municipia against any encroachments on the part of the imperial officers. As this office was nearly always assigned to the bishop of the place (Christianity having long been established in Gaul), the growth of the episcopal authority in the cities may be held to date from this period. Before this change in the administration of Gaul was made, the beginnings of still greater changes had begun to make themselves manifest. The Roman Empire was in its decline, and the constant revolutions and civil wars in the heart of the empire emboldened some of the Gaulish peoples to make attempts to recover their independence. The Romans thus found it difficult at times to maintain their power in Gaul, and the degree of the authority possessed by the empire depended chiefly upon the personal gifts of whoever happened to be at its head. The weakness of the empire was also felt by the German tribes bordering on Gaul, who did not find it difficult to establish themselves in Roman territory, when, owing to the dangers to which the empire was exposed in Italy and elsewhere, the legions stationed in Gaul had to be withdrawn, or to be reduced so much in strength as to be easily overmatched by the German invaders. The Gaulish tribes having lost their warlike habits and disposition during the Roman occupation, were no longer able to offer any resistance, so that, once the Roman legions were overcome, the German tribes found no obstacle to their settlement. It was during the fourth century, a period of growing misery in Gaul, that these settlements began to be made, and the most important of the settlers were the members of one of two confederacies of German tribes which had formed themselves on the right bank of the Rhine in the first half of the third century—one confederacy consisting of northern tribes (Sigambri, Salii, Chamavi, Marsi, Bructeri, Cherusci, Catti, &c.), who assumed the name of Franks, that is, 'the brave,' and the other of southern Suevian tribes, who called themselves the Alemanni, or 'men.' The former are first mentioned by a Latin writer, under their title of the Franks, as having been conquered by Aurelian (afterwards emperor) in 241, and it was they who set the example to the other German tribes by crossing the Rhine and occupying part of the territory as far as the Somme on its left bank. Here they were allowed to remain without interference on the part of the Romans, who were even content to recognize them as allies, and a considerable time elapsed before they made any attempt to extend their conquests. Meantime, within about half a century after the events just recorded, that is, soon after the beginning of the fifth century, the great movement of the German tribes which ultimately occupied Italy, France, Spain, and the Roman province of Africa, commenced. Hosts of Suevi, Alani, Vandals, and Burgundians overran France, where the Burgundians settled, founding a kingdom on the east in the basins of the Saône and the Rhône, while the others crossed the Pyrenees and traversed Spain, and the Vandals passed into Africa. These were soon afterwards followed by the Visigoths from the banks of the Danube, who, under their leader Alaric, founded a kingdom in the south-west of Gaul, extending from the Loire to the Pyrenees, and afterwards conquered, in addition, three-fourths of Spain. These invaders did not altogether drive out the previous Gallo-Roman occupants of the conquered land, but merely quartered themselves upon them, under the euphemistic title of 'guests,' assuming to themselves two-thirds of each estate, leaving the remainder to their 'hosts,' the original owners. There was still a portion of Gaul left under Roman rule, that, namely, to the north and west of the kingdoms of the Visigoths and Burgundians, and to the south of the territory occupied by the Franks. Scarcely had the country begun to settle down under the new arrangements when it was again invaded by hosts as numerous as the previous ones, and much more barbarous. These were the Huns, a nation of horsemen who had come from Central Asia, and who are described as hideous in appearance and savage in disposition. After destroying the Burgundian kingdom on the east side of the Rhine, having its capital at Worms (an event which forms the historical basis of part of the action of the Nibelungenlied), they penetrated, under their leader Attila (the Etzel of the Nibelungenlied) into Gaul, but were met by the Roman general Aëtius, at the head of an army composed partly of Roman legions and partly of contingents from the Visigoths, Franks, &c., and, after prodigious carnage, were defeated (A.D. 451) in a battle fought on the Catalaunian Plains (generally said to be the plain round Châlons-sur-Marne), and compelled to leave the invaded territory. Among the most prominent allies of the Romans in that sanguinary battle were the Salian Franks, under their leader Merovæus. Thirty-five years later they were turned from allies to enemies, and attacked and defeated the Romans, which was the first step in conquering the whole of Gaul and founding a new kingdom, France, which derived its name from the conquerors. Their leader at this time was Clovis, who is described by Gregory of Tours as a 'great prince and a redoubtable warrior.' He was the grandson of Merovæus, and succeeded his father Childeric in 481, five years after the overthrow of the Roman Empire in the West. To enable the reader to follow clearly the course of events that followed one another during the lifetime of this great conqueror it will be convenient to give here a statement of the political divisions of Gaul at the time when he was recognized as the king of the Salian Franks. In the south-west there was the Kingdom of the Visigoths (the capital of which was Toulouse), extending in Gaul from the Loire to the Pyrenees, and from the Bay of Biscay to the Rhône, and even over the territory on the east of the Rhone to the south of the Durance. Next there lay to the north of the kingdom of the Visigoths the Roman territory, which had been little affected by the fall of the Western Empire. It extended from the Loire to the Somme, and on the east side was bounded by the Vosges. The region lying between the Vosges and the Rhine was now occupied by the southern German confederacy, called the Alemanni, who had pushed the Burgundians further south, so that their kingdom was now limited to the valleys of the Saône and Rhône from the Vosges on the north to the river Durance on the

south. Both the Visigoths and the Burgundians had by this time adopted, to a considerable extent, the Roman civilization, and had already received Christianity. Unfortunately, however, as it turned out for themselves, they had received it from Arian missionaries. In addition to these there was a Saxon colony which had planted itself about Bayeux, in Normandy, and another small colony of British settlers in the west of Bretagne, which was named from them Little Britain. The rest of Bretagne, and all the region between the mouths of the Loire and the Seine, are said by some writers to have been inhabited by independent native tribes; but this is doubted by others, and no mention of such a circumstance is made by Gregory of Tours. Finally, the portion corresponding mainly to the modern Belgium was occupied by the Franks, who were not all under one head, but recognized various leaders, the chief of whom had their capitals at Cambrai, Tournai, Cologne, and Térouanne. It was these last then, the Franks, who were destined to bring unity out of this chaos. The Salian Franks, whose king it was, as has been already mentioned, that accomplished this, were by no means a powerful tribe. They occupied only a few districts of what is now Belgium, and could scarcely muster more than 5000 men capable of bearing arms. At the age of twenty Clovis proposed to his followers an expedition into the Roman territory, and induced the King of Cambrai to support him in his enterprise. The expedition was actually undertaken, and in the battle which ensued, near Soissons (486 A.D.), the Roman governor Syagrius was defeated, and compelled to take refuge among the Visigoths. He was afterwards delivered up to Clovis, and put to death. Clovis was now master of all the Roman territory in Gaul except the towns, the inhabitants of which, urged on by the bishops, refused to submit to the conqueror. But what he could not at once effect by force of arms was effected peacefully by his marriage with Clotilda, a Christian and a Catholic, the niece of Gundebald, king of Burgundy. The bishops, hoping that Clovis himself would soon be converted, immediately opened their gates to him. The adoption of the Christian faith by Clovis followed three years after. It is said that in the battle of Tolbiac (supposed to be Zülpich), fought in 496 against the Alemanni, who had invaded the territory to the west of the Vosges, in the hope of participating with the Franks in the spoil, Clovis, being hard pressed, vowed that he would adopt the faith of Clotilda if the battle were decided in his favour. At the end of the day the victory was his, and after the close of the war, when the Alemanni acknowledged the supremacy of the Franks, he was solemnly baptized by the Bishop of Rheims in the Athanasian or orthodox faith, and 3000 of his followers along with him.

Whatever may have been the motives which induced Clovis to take this step, it was undoubtedly the wisest thing that he could have done. It at once secured him the favour and support of all the Gallo-Roman bishops, not only in the formerly Roman territory, but also in that of the Burgundians and Visigoths. They were now as eager to see his power extended over the whole of Gaul, in order that the Arian heresy might be overthrown, as they had been obstinate in their resistance to him while he was still a heathen, and before he had married a Christian wife. This was what he was himself bent upon. As soon as he had established his power firmly in the north he turned his arms against the Burgundians, and rendered them tributary (500); and seven years afterwards, saying that 'he could not bear to see a part of Gaul possessed by these Arians,' who persecuted the bishops of the orthodox faith, he marched against them, and having subdued them, reduced nearly the whole of their territory under his sway. They were saved from the complete loss of their territory to the north of the Pyrenees only by the assistance of the great Theodoric, king of the Ostrogoths (the Dietrich von Bern of the Nibelungenlied), who had, shortly before the end of the fifth century, founded a kingdom which stretched from the most southern point of Italy to the Danube. As it was, the only part of their possessions in France which the Visigoths were able to keep was Septimania, that is, the strip of maritime country between the Pyrenees and the mouths of the Rhône. The region lying to the south of the Durance and east of the Rhône was retained by the Ostrogoths.

The dominions of Clovis, with the tributary states, now comprehended the whole of Gaul with the exception of the districts just mentioned, and of Gascony and Brittany. Into the former no Frankish army had ever entered, and the latter still maintained its independence under native military chiefs. The Saxon colony mentioned as having been planted at Bayeux shared the fate of the Roman territory by which it was inclosed. Beyond the limits of Gaul they included all the territory that had belonged to the conquered Alemanni on the right bank of the Rhine, extending to the basin of the Neckar and the Main, which was now assigned to Frankish settlers, and took from them the name of Franconia. The Alemanni were compelled to move further south, to the district of Suabia, and here acknowledged a certain amount of allegiance to the Franks as long as they did not feel themselves powerful enough to behave as an entirely independent people. Having conquered this vast territory the object of Clovis was now to rid himself of all the other Frankish chiefs, and in accomplishing this object he showed himself to be possessed of other qualities less admirable than those ascribed to him by Gregory of Tours. He did not hesitate to resort to the basest treachery and the most barbarous cruelty, either slaying with his own hands or causing to be slain all the other Frankish kings, his own relations, thus adding to his dominions all the territory on the north as far as the Rhine. He was now the sole Frankish king, the founder of the dynasty which reigned till 752, and which obtained the name of Merovingian, from his grandfather Merovæus. He died in 511, leaving his kingdom to be divided among his four sons.

This was a common practice among the kings both of this and the succeeding dynasty. The whole of the territories above mentioned, and more also, were sometimes united under one ruler, but more frequently they were distributed among different members of the reigning family. In all these divisions during the Merovingian period the chief power of the Franks was concentrated in the two districts called Neustria and Austrasia, the former of which comprised the western part of what before the conquests of Clovis was Roman territory, and the latter the eastern part of the same territory, along with the original territory of the Franks. A large part, perhaps the greater part, of the history of the Franks under the Merovingian kings is the history of the contests between these two states, and more especially of the plots laid, and the treachery and cruelty practised by the rulers of each to overthrow the power of the other; for in respect of the cruelty and treachery of their disposition, and their utter disregard of family ties, the most of the descendants of Clovis closely resembled their ancestor. As illustrative of the general character of these times it is enough here to make reference to the crimes and intrigues of Fredegonde of Neustria, and Brunehaut or Brunehilde of Austrasia, an account of whose careers will be found in the articles devoted to them. (See BRUNEHILDE and FREDEGONDE.) It is needless at this place to go into

the details of this confused and bloody period. All that is necessary is to give a general account of the position which the Franks then occupied in Europe.

The spirit of conquest which was so powerful in Clovis still lived in his sons, and under them the Franks, though divided, succeeded in enlarging their empire still further. Thuringia was conquered (530), Burgundy reduced from a tributary to a subject state (534), and the Alemanni of Suabia fully incorporated in the Frankish Empire. Under Clotaire I., the last surviving son of Clovis, the dominions of the Franks, thus extended, were in 558 united under one ruler for the first time since the death of Clovis. Clotaire I. lived till 561, when the dominions of the Franks were again divided, and it was during this second division that the two princesses above mentioned flourished. The next unification took place under Clotaire II., who reigned as sole king from 613 till 622, when he appointed his son Dagobert king of Austrasia, under the guardianship of the mayor, Pépin of Landen, and Saint Arnoulf, bishop of Metz—a circumstance which is memorable on this account, that these two guardians of Dagobert were both ancestors of that line of mayors of the palace which, after usurping all the royal power, culminated in the Carlovingian dynasty of kings. A son of Arnoulf married a daughter of Pépin, and the offspring of this union was Pépin d'Héristal, the first of the mayors referred to. On the death of Clotaire II. in 628, Dagobert succeeded him as sole king, and his reign saw, in the first place, the Frankish power raised to the greatest height which it reached under the Merovingians, but saw also the beginning of its decline. During the most prosperous part of his reign his dominions extended from the Weser to the Pyrenees, and from the Atlantic Ocean to the frontiers of Bohemia. He was the ally of the emperors of Constantinople; he interfered in the affairs of the Visigoths of Spain, and in those of the Lombards of Italy. In short, he might be regarded as the head of all the barbarian tribes which then occupied the provinces that had formerly constituted the Roman Empire in the west. But even during his lifetime the hold of the Franks on some of the more remote parts of their dominions began to be loosened, and after his death in 638 the states which broke away from their allegiance became more numerous. The kingdom was then once more divided, one of his two sons (both minors) receiving Neustria, under the guardianship of Erkinoald, and the other Austrasia, under that of Pépin of Landen.

It was at this period that the personal authority of the Merovingian kings began to sink into insignificance, and their power to be usurped by the mayors of the palace. This was more particularly the case in Austrasia, where the authority of the king was entirely set aside, while in Neustria there was still some lingering respect for the Merovingian race. In the former kingdom the great vassals or nobles entirely refused any allegiance to the king, and conferred on two of their number, Pépin d'Héristal and his cousin Martin the title of Dukes of the Franks (679). Ebroin, the successor of Erkinoald, had meanwhile crushed with vigour similar attempts that had been made in Neustria, and some of the Neustrian nobles having fled to Austrasia, Ebroin now demanded that they should be given up. This was refused, and war broke out between the two kingdoms. A battle was fought at Testry, near Péronne, in 687, in which *Roman France*, as Neustria had now come to be called, was vanquished by *Teutonic France*, and the authority of Pépin d'Héristal (Martin having been treacherously slain some years previously) rendered supreme throughout the kingdom. This date may be regarded as that of the real termination of the Merovingian line, for although kings belonging to this family continued to be crowned till 752, they were mere puppets, 'rois fainéants' as they are generally called: the real power was in the hands of the mayors of the palace.

It was natural that during these internal commotions among the Franks the dependent states in France and Germany should have disowned their allegiance, and the first efforts of the new masters of Neustria and Austrasia were directed towards bringing them again into subjection, as well as towards reducing the power of the Frankish nobles, who no longer paid any respect to the royal authority or those who had assumed it. Pépin died in 714 without doing much to effect either object. He was succeeded, after a brief period of anarchy, by his son Charles Martel, or Charles the Hammer—a title he earned by the courage and strength he displayed in battle. During his tenure of power all Europe was threatened by the Saracens, who, after traversing the north of Africa, had crossed over into Spain and occupied it, then penetrated into France and seized Aquitaine, at that time ruled over by a member of the Merovingian race holding the title of duke. He appealed for assistance to Charles Martel, who met the Saracen hosts on a plain between Tours and Poitiers, where in 732 he totally defeated them in a battle which, on account of its carnage and the decisive nature of its results, calls to mind that fought against the Huns on the Catalaunian plains. The Saracens were at once driven from every part of France except Septimania, which they had taken from the Visigoths, who had continued to hold it ever since the overthrow of their kingdom by Clovis. Another consequence of this battle was that the Duke of Aquitaine took an oath of allegiance to Charles Martel. Pépin le Bref, the son of Charles Martel, was the first of his family who was recognized as King of the Franks. He succeeded his father in the possession of Neustria in 741, while Austrasia fell to his brother Carloman, who died in 747. Wishing to gain the favour of the Neustrians, who were still inclined to the Merovingian house, he at first proclaimed Childéric III. as king, although the throne had been for some time previously left vacant; but ultimately he referred to Pope Zacharias the claims of himself and of Childéric to the title of king, and the pope replied that he should bear the title who held the power. In 752 Pépin was crowned and anointed King of the Franks by Boniface, archbishop of Mayence. Childéric, the last of the Merovingians, was confined in a monastery. From this date the reign of Pépin was one of almost continuous war and conquest. In Italy he defeated the Lombards, and gave their territory to the popes; in France he wrested Septimania from the Saracens (752–759), and subjugated Aquitaine (759–768). In 768 he died, and was succeeded by his sons Charles, afterwards known as Charlemagne, and Carloman. The latter dying in 771, Charlemagne then became sole ruler, and by him was effected what his ancestors from Pépin d'Héristal had aimed at, the reduction of all the territories that had at any time been subject to the rule of the Franks. He effected even more than this, for he conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III. on Christmas-day, in the year 800, he was crowned in the name of the Roman people as Emperor of the West. His power was respected by the emperors of Constantinople, and his fame extended so far that even Harun Al Raschid, the caliph of Bagdad, sent him valuable presents from the far East. He died in 814.

The glory of the Carlovingian line of kings may be said to end with Charlemagne himself, although he was only the second of his family who bore the title of king, and although it is from him that the line is named. After his death, or at least after the death of his son Louis I. (le Débonnaire), in 840, the history of the Carlovingians bears a close resemblance to that of the Merovingians, until in 987 it reaches a similar termination. The latter part of the reign of Louis was disturbed by the quarrels of his sons, whom he had now associated in the government with himself, but who were unable to agree as to the share of the empire which should fall to each. After the death of Louis they took up arms against each other, and it was not till after the hard-contested battle of Fontenailles in 841 that peace was brought about and the brothers agreed to the partition of the empire proposed in the Treaty of Verdun (843). According to this treaty Italy, Burgundy, and that part of Austrasia which hence took the name of *Lotharii regnum* (Lotharingien, Lothringen, Lorraine), fell, along with the imperial dignity, to Lothaire, France to Charles the Bald, and to Louis the territories on the right bank of the Rhine. From this time the tribes in the east began gradually to fuse together into one nation, and the separation between France and Germany became proportionally more and more distinct. They had not yet, however, been united for the last time under one rule. After Charles the Bald had been succeeded in 877 by Louis II. (le Bègue, that is the Stammerer), and Louis II. by Louis III. (879–882) and Carloman (879–884), the whole of the dominions of Charlemagne came under the sway of Charles the Fat, who remained sole ruler of the empire till 887, when he was deposed. From that date the political history of France is distinct from that of Germany.

The royal power in France was then usurped for a time by Eudes, count of Paris, but in 893 Charles III. (the Simple), the brother of Louis III. and Carloman, was recognized as king. His kingship, however, was merely nominal. Since the death of Charlemagne it gradually came to be an established custom that the son should succeed to the feudal possessions of the father, and in 877 the right of hereditary succession to fiefs was recognized by law. The result was that by the time of Charles the Simple France had in effect become covered with a multitude of petty kingdoms, the rulers of which bore the titles of dukes and counts. Thus the Duke of Gascony possessed nearly all the district to the south of the Garonne; the Counts of Toulouse, Auvergne, Périgord, Poitou, and Berry, the provinces between the Garonne and the Loire; and the regions to the north and east of the latter river belonged to the Count of Forez, the Duke of Burgundy, the Duke of France, and the Counts of Flanders and Bretagne. The entire possessions of the king consisted of a few towns that he had not as yet been compelled to give away as fiefs. His reign is memorable for one great event, which is even more important in its bearings upon English history than on that of France. In the midst of these powerful nobles Charles found himself almost impotent, and was quite unable to offer any adequate resistance to the Norman pirates who had long ruled the seas and devastated the coasts of England, France, and other countries, and who now made more frequent and more destructive incursions into French territory. Charles, accordingly, adopted the wisest policy that he could have followed in the circumstances—surrendering to them in 912 the province which took from them the name of Normandy in order that they might settle there peacefully and cease to lay waste the country by their ravages. Towards the end of his reign Charles found himself so weak as to be unable to resist his own nobles, who in 922 elected one of their number, Robert, duke of France, king, in opposition to him, and upon the death of Robert in 923 conferred the same dignity upon Raoul or Rudolph, duke of Burgundy. During this period Hugh of Paris, as he is generally called, duke of France, was really the most powerful person in the kingdom, and held King Charles in close captivity. Charles died in 929, but was not succeeded by any king of the Carlovingian dynasty till the death of Raoul in 936, when there reigned in succession till 987 the son, grandson, and great-grandson of Charles—Louis IV. (D'Outremer), from 936–954; Lothaire, from 954–986; and Louis V., from 986–987. During these three reigns the real power, such as it was, was held by Hugh of Paris till his death in 956, and then by his son Hugh Capet. On the death of Louis V. without children in 987 Hugh Capet mounted the throne himself, and thus became the founder of the Capetian dynasty.

At the accession of the Capetian line of kings the first task which they had to perform was to reconquer their prerogatives from the great vassals. The fact that by the transference of the crown to Hugh Capet it was united to the great fiefs of Paris and Orleans was indeed in itself a great addition to the strength of the monarchy; but in spite of that the kings did not acquire any great power in France till the time of Philip Augustus at the end of the twelfth and the beginning of the thirteenth century. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I. (died 1060), and Philip I. (died 1106), who effected nothing whatever towards the establishment of the royal authority, deserve merely to be mentioned in this sketch. At the death of Philip I. the royal domain was considerably smaller than it had been under Hugh Capet, and the authority of the king was scarcely regarded even in the parts around his own immediate possessions. It may be worth while to remember, however, that though Philip himself was so inert and incompetent a monarch it was during his reign that one French subject conquered Normandy, another Sicily and Southern Italy, and a third Portugal, each founding royal dynasties in the lands they conquered; and that the first of the great Crusades, mainly composed of Franks, set out to deliver Jerusalem from the infidels, and founded a Frankish kingdom in the Holy Land. When Philip I. died he was succeeded by Louis VI. Louis was a complete contrast to Philip, resolute in his endeavours to make his power felt throughout his kingdom, and active in the field, compelling his refractory nobles to yield submission. Two circumstances aided him in his efforts. The one was that many of his nobles had greatly weakened their power in order to equip themselves for the great Crusade, or had joined it and never returned; and the other was the growth of towns and communes, which ultimately became the allies of the kings in keeping a check on the nobles. Louis VI. granted eight charters to communes, that is, gave the royal sanction and guarantee to treaties of peace which towns that had grown up on the fiefs of vassals had been able to exact from their feudal superiors and by which they secured to themselves certain rights and privileges, and a certain measure of independence and self-government. These communes continued to grow in number and strength till the fourteenth century, when their charters were torn up, but not before they had nurtured a new class of society, which was able in some respects to fill their place.

Louis VI. died in 1137, and was succeeded by his son Louis VII., who reigned till 1180. Louis VII. was not, like his father, an active soldier, but

under the guidance of Suger (who had been confidential adviser likewise to Louis VI.) he followed the same policy. During his reign the stability of the French throne was endangered by the great influence acquired in France by Henry II. of England, who possessed either by inheritance or by marriage the whole of the west of France except Brittany, and obtained some influence even in that province by the marriage of one of his sons with the only daughter of the count. Fortunately for France, Henry, through domestic embarrassments, was unable to pursue any schemes of conquest which he might have cherished against his feudal superior in France. Louis was succeeded by his son Philip Augustus (Philip II.) In accordance with the custom of the Capets, Louis had taken care to have him crowned as his successor during his lifetime, and the *peers* of France, that is, the great nobles who held their fiefs directly of the crown (not including those who held their fiefs of the king as vassals of the Duke of France), were present at the ceremony, one of the first signs of the growing power of royalty. The vigour of Philip saved the throne of France from the danger with which it was threatened by the great ascendency which the King of England had acquired among the vassals of the King of France. Having summoned the weak King John to appear before the court of peers to answer for his conduct in the case of Prince Arthur, he declared, when John refused to appear, his fiefs to be confiscated, and at once proceeded to execute the sentence by seizing Normandy, Maine, and Anjou. His son Louis VIII., who succeeded him in 1223, carried on the work by the conquest of Poitou, and was proceeding to that of Guienne when he was diverted from it by the hope of making a great acquisition in Languedoc. Here a religious war had sprung up against the Albigeois, who were defended by the Count of Toulouse, and the final result of the war was the extinction of the house of Toulouse and the strengthening of the crown by their domains passing to the royal family and ultimately to the crown itself. Louis VIII. had died in 1226, before the completion of the war, but not before a decidedly preponderating influence had been acquired for the crown. This influence was still further increased and the unity of France more firmly consolidated in a peaceful way by the wisdom and justice of Louis IX. (St. Louis), whose Establishments, belonging to the close of his reign, may be regarded as having put a formal seal upon this re-established unity, for these form the first legislative enactments of the house of Capet, the first instance of general legislation for the Kingdom of France for nearly 400 years, the last Capitulary or general law having been promulgated in the reign of Charles the Simple. (For the part which this monarch, as well as Philip Augustus and Louis VII., took in the Crusades, see CRUSADES.)

Louis IX. died in 1270, and from this date, under Philip (III.) the Bold (died 1285), Philip (IV.) the Fair (died 1314), Louis X. (died 1316), John I. (died 1316, after a reign of five days), Philip V. (died 1322), and Charles IV. (died 1328), the crown continued steadily to increase in power by the acquisition of fresh domains and other means until the outbreak of the wars with England. In the reign of Philip III. a blow was given to the declining power of the nobles by the institution of letters of nobility conferring the rank of nobles upon commoners. Still more important was the recognition by Philip IV. of the *bourgeoisie*, the new class of society that had grown up in the communes, by calling their representatives as deputies of the cities to form one of the three orders of the States General (*états généraux*), which were first convoked by this monarch in 1302. The other two orders consisted of the clergy and the nobility. No small accession of strength to the crown was gained also by the suppression of the order of Knights Templars and the confiscation of their vast possessions, as also by the election of a French pope, who resided at Avignon under the influence of the French monarch.

The first branch of the Capetian line of kings became extinct on the death of Charles IV., the last of the sons of Philip the Fair, for what is called the Salic law (from the fact of its being the rule of succession to fiefs among the Salian Franks), which excluded women from the throne, had become the rule of succession in the case of the crown of France. The right of succession thus reverted to Philip of Valois, son of Robert of Valois, and grandson of Philip the Bold, who actually obtained the crown as Philip VI. His claim was disputed by Edward III. of England, who asserted his own right to the kingdom, on the ground that although the Salic law excluded women from the throne, it did not prevent a woman from transmitting the right of succession to her descendants, and that therefore he was the rightful heir as the son of Isabella, daughter of Philip the Fair. The claim thus set up by Edward led to wars between England and France, which were not terminated for more than 120 years. During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI., and after his death in 1450 over John (II.) the Good, who was taken prisoner at Poitiers in 1456, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V.) the Wise, who succeeded John the Good in 1364, and his constable, the brave Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI. (1380–1422), disturbed by a rising of the peasantry and the *bourgeoisie*, which took place about the same time as that under Wat Tyler in England; by the struggles between the Duke of Orleans and the Duke of Burgundy (whose partisans were known respectively as the Armagnacs and Bourguignons) for the regency; and finally by foreign war, Henry V. of England having revived the claim of Edward III. to the French crown. The military successes of Henry led to the Treaty of Troyes (1420), by which he was to receive the hand of the daughter of Charles VI. in marriage, and the right of succession was settled on himself and his descendants, to the exclusion of the dauphin, afterwards King Charles VII. Charles VI. died in 1422, a few weeks after Henry V., whose son Henry VI., a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431, amidst the licentiousness of war, of factions, and of manners, a peasant girl (see JOAN OF ARC) animated the French in the cause of the dauphin, who was crowned as Charles VII. at Rheims, July 17, 1429, and in 1451 the English had lost all their possessions in France, except Calais.

During the wars of that period the French kings had obtained the means of wielding an almost absolute power by the institution of a standing army. It consisted of two bodies, one being entirely cavalry, called ordinance companies, because they were created by the ordinance of Orleans in 1439; and the other infantry, created by another ordinance in 1448. From that time it was the policy of the kings to obtain an unlimited authority by destroying the liberties of the states, and at the same time to turn the

warlike spirit of the nation to foreign conquests. The despotic policy of Louis XI. (1461–83), whose maxim was *Dissimuler c'est regner*, effected this object by violence and cunning. In his reign some of the most important fiefs in France were united to the crown; Maine, Anjou, and Provence were left to Louis by the will of the last count; and a large part of the possessions of the Duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII. (1483–1498), united also Brittany to the crown by his marriage with Anne, the heiress of the fief; but he restored to Maximilian of Austria, who had married Mary, the daughter of Charles the Bold, Franche Comté, in 1493. He then undertook the conquest of Naples (1494), to which he made pretensions as heir of the house of Anjou. After a triumphant campaign in Upper and Middle Italy he took possession of Naples; but an alliance formed between Milan, Venice, and the Pope soon after compelled him to withdraw.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orleans (1498), in the person of Louis XII., who was descended from Louis of Valois, duke of Orleans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. He was, on the whole, a just and beneficent ruler; but the ambition of conquest involved him in disadvantageous wars. As the grandson of a daughter of the house of Visconti he laid claim to the Duchy of Milan, which had been usurped by the Sforzas; and as the heir of Charles VIII. he maintained the pretensions of that monarch to Naples. Both of these claims he endeavoured to make good by arms, and in both cases was at first successful, in the case of the latter aided by Ferdinand of Arragon. Ultimately, however, he lost all his conquests. His ally in Naples, by his wily policy and his success in the field, managed to keep that territory to himself; and in the war with the league formed against him by Pope Julius II. he lost Milan and the supremacy of Genoa. It is this war that is celebrated for the exploits of Gaston de Foix.

On the death of Louis the crown reverted to another branch of the house of Valois, that of Angoulême, Francis I. (1515–47) being the grandson of John, count of Angoulême, uncle of Louis XII. Francis I. still continued the attempts at foreign conquest that had been made by his two predecessors, and in the great battle of Marignano, fought in 1515, he recovered Milan, with the supremacy over Genoa. But this duchy was now claimed by Charles V. of Germany, the life-long rival of Francis, as an imperial fief, and from these opposing claims there resulted five wars between France and Germany. In the first Francis was compelled to quit his hold of Milan and Genoa, and retreat across the Alps. In this retreat fell the valiant Bayard, 'the knight without fear and without reproach.' He soon after again invaded Italy, but was taken prisoner at the battle of Pavia (1525), and could regain his liberty only by agreeing to the Peace of Madrid (1526), in which he renounced Milan, and ceded the Duchy of Burgundy to Germany. By the Peace of Cambrai, however, concluding the second war, this duchy was restored to him (1529). The third war was concluded by the truce of Nice (1538), which left to each of the combatants whatever he happened to possess at the time. Finally, in the Peace of Crespy (1544), concluding the last war between France and Germany carried on in the lifetime of Francis and Charles, the former was allowed to retain both Burgundy and the Duchy of Savoy and Piedmont, which he had seized in the third war. In his reign also Brittany was definitively united to the French crown. Henry II. (died 1559) pursued the same policy as his father Francis. War was renewed for the fifth time with the house of Hapsburg, then represented by Philip II. of Spain, the son of Charles V., as well as by the Emperor Ferdinand, brother of Charles. In the Peace of Cateau-Cambrésis (1559), by which the war was concluded, Savoy and Piedmont were surrendered by Henry, with the exception of a few towns which were ultimately given up by France. On the other hand, Henry remained in possession of the German bishoprics of Metz, Toul, and Verdun, which he had conquered with the aid of Maurice of Saxony. Thus was an end put to the open war between the monarchs, without, however, extinguishing the hereditary hostility between the kings of France and the house of Hapsburg. In the same reign Calais was recovered from the English (1558). Francis II., the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559–60). In the time of Francis I. religious persecutions opposed the progress of the reformation in France, and the persecutions were continued under his successors Henry and Francis. The foundation of the national-debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX. (conducted during his minority by the queen-mother, Catharine de' Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. (See BARTHOLOMEW'S DAY.) These continued throughout the reign of Charles IX. and his successor, Henry III. (1574–89), and were only terminated when Henry of Bourbon, king of Navarre, and since the death of Henry III. king of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

With Henry III. had expired the last branch of the house of Valois, and Henry IV. was the first French sovereign of the house of Bourbon, which inherited its right to the throne from Robert, count of Clermont, the sixth son of Louis IX. He united to the crown of France the Kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman. After restoring peace to the country within and without, he granted religious toleration and full political privileges to the Calvinists by the edict of Nantes in 1598, and aided by the counsel of the wise Sully laboured diligently for the welfare of the state. While cherishing the great design of founding, with the aid of the Protestant union in Germany, and other European powers, a great Christian empire offering equal political privileges to Catholics, Lutherans, and Calvinists, and thus of humbling the house of Hapsburg, he was cut off prematurely by the dagger of the fanatic Ravaillac (1610). During the minority of Louis XIII. the French policy was at first wavering, until the prime minister, Cardinal Richelieu, gave it a steady direction. He took advantage of the Thirty Years' War to humble Austria and Spain. He created that domestic despotism in France which rendered the government completely absolute, but finally occasioned the overthrow of the monarchy. The States General were assembled in 1614 for the last time till the Revolution. Louis XIII. died in 1643, the year after his great minister. The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis

was declared of age. Although enjoying the full confidence of the regent, Mazarin, as a foreigner, and, like Richelieu, the oppressor of nobles and commoners, was generally hated, which led to a rebellion and civil war (the wars of the Fronde—1648–53). Mazarin was compelled for a time to leave France, but soon returned more powerful than ever. In the first part of his ministry France obtained, by the Peace of Westphalia (1648), which concluded the Thirty Years' war, the German province of Alsace, and was confirmed in the possession of the bishoprics of Metz, Toul, and Verdun. The last work of Mazarin was the Peace of the Pyrenees (1659), by which France received from Spain additions both in the north and in the south, fourteen towns of Flanders, Hainaut and Luxemburg, along with the greater part of Artois on the north, and Roussillon on the south.

After the death of Mazarin, in 1661, Louis XIV. took the government into his own hands, and the period which follows is the most brilliant in French history. His ministers, especially Colbert, the great fosterer of French trade and manufacture, and generals such as Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; and the writers of the period include the greatest names in French literature. Throughout his long reign Louis XIV. was chiefly bent on acquiring glory and increasing his empire by war. Accordingly he took advantage of the death of Philip. IV. of Spain to claim the Spanish Netherlands, in right of his wife, the daughter of that monarch; but was compelled to desist in his enterprise by the Triple Alliance between England, Holland, and Sweden. To punish Holland for its interference on this occasion his next war (1672–79) was waged primarily against that state, although Spain and the German Empire afterwards took part in it on the side of Holland. By the treaties of Nimeguen in 1678 and 1679, which concluded the war, France received Franche Comté and all the fortified places in the line of Valenciennes and Maubeuge from Spain, besides Freiburg in Breisgau from Germany. All these acquisitions were left untouched by the Peace of Ryswick in 1697, by which France was also maintained in the possession of Strasburg, a city which it had seized in 1681 from the Germans in the midst of peace. The last war of the reign of Louis XIV., the war of the Spanish Succession (1701–14), added little to the military glory of France, but Louis was nevertheless able to conclude it by sufficiently advantageous treaties (Utrecht, 1713; Rastadt and Baden, 1714). During this reign great injury was done to French industry by the revocation of the Edict of Nantes in 1685. Louis XIV. died in 1715, leaving a national debt amounting to no less than 4,500,000,000 livres.

Louis XV., the grandson of Louis XIV., succeeded at the age of five years. During his minority the regency was held by the able but licentious Duke of Orleans, who squandered in the most reckless manner the revenue of the state. It was during this period that the great Mississippi scheme was started by John Law, which created a perfect mania for speculation in France, but ultimately brought ruin on thousands of those who had a share in it, although many of the great had managed to enrich themselves by it. In 1723 Louis was declared of age. In the first part of his reign, during which he was chiefly guided by the wise minister Fleury, he was the favourite of the nation, and earned the title of the 'Well-beloved;' but when he sunk under the pernicious influence of the Marquise de Pompadour, the love of his people was gradually converted into hatred and contempt. The extravagance of the luxurious and licentious court, in addition to the useless and costly wars in Germany (war of the Austrian Succession, 1740–48; Seven Years' War, 1756–63), exhausted the treasury and necessitated the increase of the taxes, which already pressed heavily on the bourgeoisie and the peasantry, all the more heavily because the nobility and the clergy were exempt from taxation, and because the taxes were not raised by the government itself, but by the farmers of the revenue and their extortionate officers. At this time it was the custom that every new tax should be registered at the parliament of Paris, the supreme court of justice, and from this circumstance the court concluded that, in absence of the states-general, which had not been convoked since 1614, the validity of any edict imposing a new tax depended upon its consent, and hence violent disputes arose between the parliament and the government at every new impost. Another source of constant strife between parliament and government was the *lettres de cachet*, a despotic encroachment upon personal liberty, inasmuch as any person might be apprehended under such a warrant and committed to prison without any reason being assigned. After a ten years' struggle Louis, wearied of the persistent opposition of this body, gave it a new constitution, and caused its most refractory members to be arrested. The final settlement of these disputes was thus postponed till the next reign. During this reign two important acquisitions were made by France. These were: Lorraine, joined to France in 1766, in accordance with the Treaties of Vienna of 1735 and 1738; and Corsica, bought from the Genoese in 1768, conquered in 1769.

With the reign of Louis XVI. begins the period of expiation for the crimes of the French monarchy and aristocracy, which had culminated in the preceding reign. The epoch is the more marked that the king himself was personally virtuous, and not only amiable in his private character, but patriotic in his designs, and even liberal in the conduct of his government. The fall of feudalism had left the nobility dependent on the court, but in France the people had no share in this victory. The monarchy had been powerful enough to suppress not only the independence of the nobles, but the representative institutions of the country. The fall of feudalism had thus resulted only in the destruction of those privileges of the nobles which interfered with the authority of the crown, and had left standing those which were merely oppressive to the people. Private jurisdictions, seignorial and ecclesiastical, and local customs clogged the administration of the law, and the officers of justice appointed by the crown bought their appointments and sold justice to the people. Thus the royal prerogative had only created a new privileged class, the aristocracy of the robe, which, by the organization of the parliaments, had become the only power except the king which had a voice in public affairs, and whose interests as often coincided with those of the other privileged classes as with those of the people. The nobility was rewarded for its subservience to the court by a multitude of oppressive privileges which bore heavily on the industry of the country, while on the unprivileged classes fell the whole burden both of local and imperial taxation. Only half of the territory of France belonged to them, and it had to bear the whole burden of seignorial and royal taxes, the tithes of the clergy, and the corvées or levies for the maintenance of the public roads. A line of 1200 leagues of internal customs and numerous special privileges hindered the development of trade and commerce. The wretched financial administration and extravagant expenditure of the court made the public taxes intolerably oppressive, at the same

time that they reduced the exchequer to bankruptcy. The farmers-general secured their shameful powers by bribery, in which even Louis XV. participated; and such was the discredit of the government that it could not borrow without security, and then only on the most usurious terms. It was easier for the English government to raise money at 4 per cent. on its own word than for the French to borrow at 20 per cent. on the security of the revenue. Among the desperate expedients employed to fill the exchequer was the creation and sale of offices, the holders of which were entitled to prey on the people. The offices of assayers of beer, controllers of perruques, hereditary criers of interments, were among the fantastic privileges thus disposed of, while the holders of official appointments were so numerous that the clerks in the *grenier à sel* at Paris only exercised their functions one year in three. The organization of the army suffered equally with all other public interests. A cavalry regiment of 482 men had 142 officers, and the higher appointments could be held only by nobles. Hence the military power which France had exhibited in the reign of Louis XIV., and was again to exhibit in that of Napoleon, had prematurely declined. A French writer (Forbonnais) estimates the number of officers of justice and finance in 1666 at 47,780, and values their places at 420,000,000, or 1,000,000,000 francs at the present day. The higher clergy were exempt from taxation, but the lower were not exempt from beggary. An army of 15,000 monks subsisted on the charity of a people which, besides the tithes of the clergy, had already given a large part of its territory to the church. Thus the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The time of reaction had now come, that of repentance and reformation for the privileged orders was already past.

Louis XVI., son of the dauphin and grandson of Louis XV., ascended the throne on the death of the latter, 10th May, 1774. With good intentions, he wanted firmness to carry them into execution, and especially to resist the intrigues of interested courtiers alarmed at the threatening aspect of the times, and was in every way unfitted to guide the state through the approaching crisis. The first difficulty of his government, and the rock on which it split, was the hopeless and unmanageable condition of the public finances. His first ministry contained two men of integrity and ability, Malesherbes and Turgot. The latter founded his financial reforms on extensive projects of political amendment—the abolition of corvées and maîtrises (masterships, or exclusive privilege of conducting particular trades), or territorial taxation, the free circulation of grain, and other measures—all conceived in just anticipation of the demands of the people, but amounting to an actual revolution, and undertaken without due calculation of the resistance of the privileged classes. Of these classes the parliament of Paris made itself the champion. The project of replacing the corvée by a territorial tax was only registered in a *lit de justice*. By a device often practised the prejudices of the people were excited against their real interests by misrepresenting the projects of the minister, particularly in regard to the circulation of grain. Maurepas, the head of the ministry, was averse to the reforms of Turgot; and the feeble king, who personally favoured them, yielded to the opposition. Turgot was dismissed (12th May, 1776) and his reforming measures rescinded. In October, 1776, another man of note was called to the administration of the finances. Necker, a Swiss banker, who had already assisted the government with advances, was an able financier and a sentimental Liberal, but had neither the broad views of Turgot, nor the tact and insight of a statesman. His hazardous tampering with reforms which he could not control largely contributed to bring on the revolution. Necker introduced many administrative reforms, which, though ineffectual to cover the gulf in the finances, excited the opposition of those interested in abuses. The occasion of his fall was significant. In 1781 he published a *compte rendu* of the finances, which, though very incomplete, was an appeal to public opinion, an innovation which alarmed and shocked all the upholders of the established order. His resignation was offered and accepted 21st May, 1781. During his administration war broke out with England, in consequence of the support afforded by France to the revolted American colonies of Great Britain—a war of fatal omen to the French monarchy, into which the vacillating king was dragged by the force of public opinion, the power and direction of which were thus early indicated. A treaty of commerce and alliance with the United States was signed 6th February, 1778, and was followed by an immediate declaration of war by England. The war was successful in its immediate object, and was terminated by the Treaty of Versailles, 3d September, 1783. Three years afterwards a commercial treaty was concluded with England.

A fatal result of the weakness of the king was that the queen, who was naturally of a firmer temper, began to take an interest in the government. Her influence, not being legitimate, necessarily took the form of intrigue, and made her the centre of the reactionary tendencies of the court and the privileged orders; thus exciting the jealousy and suspicion of the lower orders, and arousing against her a hatred without bounds, and which, in spite of her private virtues, could not be satiated until both her husband's blood and her own had stained the fall of the monarchy. By her influence Calonne became controller-general of the finances from 1783 to 1787. His first plan was to maintain the public credit by a brilliant and extravagant expenditure, and meet the wants of the treasury by borrowing. When this failed he resorted to the reforms of Turgot and Necker. A meeting of the Notables was called for 12th February, 1787. Calonne unfolded to them his plans, which were rejected. He was dismissed and banished to his estates. The opposition to reform had again triumphed; but in the assembly of the Notables a demand had been made for the convocation of the States General. Brienne, archbishop of Toulouse, one of the most active opponents of Calonne, was appointed to succeed him. The Notables were dismissed, and territorial taxation imposed in a *lit de justice*. The parliament, which resisted, was banished. The utter destitution of the finances, however, put a speedy end to the ministry of Brienne, and Necker was recalled 24th August, 1788. All ordinary measures were now unavailing, and Necker demanded the convocation of the States General. This body was convoked for 1st May, 1789, but even in the manner of convoking it a disastrous error was committed. The three estates had on former occasions met separately and voted by orders. Necker, with the Liberals, was desirous of giving more power to the tiers état, which had become in fact the most powerful order in the state. He proposed to double the numbers of the tiers, and to substitute an individual vote for the established method of taking the vote by orders. These changes were submitted to an assembly of Notables, which refused to sanction them. Necker then established the double representation by an order of the council, leaving the question of voting undetermined. An imperfect power was thus given to the tiers état, which carried with it an irresistible suggestion of its

completion by a usurpation of authority, and that body was, almost independently of its own will, driven on the course of revolution. The States met on 5th May. The *cahiers*, or powers and instructions of all the orders to their representatives, were full of demands for fundamental reforms. The first business which demanded the attention of the States was the authentication of the powers of the members; the mode of proceedure in which would determine the order of meeting and voting. The tiers état demanded that this should be done in common; the other orders wished to proceed to the verification apart. After a brief struggle, during which an oath, called the *serment de la jeu de paume* (20th June), was taken by the deputies of the tiers, who had assumed the title of the National Constituent Assembly, not to separate till they had given a constitution to France, the clergy and then the nobles yielded, and the fusion of the three orders was effected on 27th June. The fusion had been effected against the will of the king; but when the crisis came he had as usual yielded to pressure, and then suffered himself to be led by the reactionary intrigues of his court. Necker was dismissed on the 11th of July, and recalled on the 27th. Foreign troops were brought to Paris to overawe the assembly. The people demanded arms, which the municipality of Paris supplied; and on 14th July the Bastille was captured and destroyed. The garde bourgeoise, formed by the municipality, was now transformed into the national guard. The command was given to Lafayette, who formed its colours by placing between blue and red the colours of Paris, white, the emblem of the French monarchy. Thus was originated the flag of the republic. The spirit of insurrection in the meantime had, since the beginning of 1789, been spreading in the provinces, and the urgency of affairs induced the assembly, on the 4th of August, to take a decisive step. On the basis of a future compensation all privileges were abolished. A banquet given to the foreign troops at Versailles at a time when the populace was threatened with famine, excited another insurrection. Versailles was attacked by the mob, and the king brought a prisoner to Paris (5th and 6th October, 1789). On this occasion, as on the taking of the Bastille, the ferocity and bloodthirstiness of the more lawless portion of the mob began to be fearfully manifested. This popular outbreak occasioned also the beginning of the emigration, so fruitful in future disasters to France. The king's brother, the Comte d'Artois, and others of his more extreme councillors, fled, and by transferring their intrigues to foreign courts, hastened the revolution, and prepared the way for the devastating wars by which it was followed.

In December, 1790, the king began to correspond secretly with foreign powers, and a secret convention had been made with Austria, Prussia, Piedmont, Spain, and Switzerland, to advance their troops to the frontiers with a view to a simultaneous occupation of the territory. To give effect to this plan it was necessary that the king should be free. In concert with the Marquis of Bouillé, who commanded the troops in the north of France, Louis made his escape from Paris (20th June, 1791), and endeavoured to reach Montmédy; but he was recognized on the road, arrested at Varennes, and brought back to Paris escorted by the commissaries of the assembly. A demonstration in the Champ de Mars, in favour of his deposition (17th July), was put down by force by La Fayette and Bailly, under order of the assembly. The popularity of that body, already declining, was seriously compromised by this step, but its labours were now drawing to a close.

On the 30th September, 1791, it brought its work to a finish, after having redeemed its oath of 20th June. The constitution was sworn to by the king on 14th September, after which he was reinstated in his functions. Its political provisions were a single legislative assembly elected biennially; the executive power with a four years' veto, except in finance, to the king; the primary electoral colleges to consist of all citizens of twenty-five years of age and upwards, paying in direct taxes the equivalent of three days' labour annually. This limitation of the franchise was already looked upon as reactionary. The constitution embraced all those civil reforms which, afterwards incorporated in the code Napoleon, survived the political changes of the revolution. It deprived the king of arbitrary powers, and voted him a civil list; it provided liberty of worship, freedom of the press, of commerce, of industry; the laws of primogeniture and entail were abolished, and equal division of property among children made compulsory; confiscation of property for offences was abolished, and personal punishment substituted; titles were abolished; the clergy were reduced to public functionaries, salaried by the state; the territory of France was declared free through all its extent, and a re-division of it was effected (15th Jan. 1790) into eighty-three departments, nearly equal in extent; each department was divided into districts, each district into cantons, each canton into communes and municipalities. The number of the last was 44,828. This division afterwards proved an admirable instrument of centralization, and in repeated emergencies enabled Napoleon at once to lay his hand with ease upon all the military resources of France. With some excesses these measures swept away at one stroke all the real grievances which supplied the motive force of the revolution, and could they have been peaceably maintained it might have ended here. But they were the result of a sudden flood of enthusiasm which took no account of opposition, and which had only dispossessed and not destroyed the rival interests. One of the measures already mentioned in particular demands further details, as it was the means of meeting the financial difficulty, and at the same time of arming the enemies of the revolution, at whose expense it was effected. On 2d. December, 1789, the domains of the church were, in the euphemism of the assembly, put at the disposition of the nation. The minister was authorized to sell these estates to the extent of 400,000,000 livres. Until the sale was effected he was authorized on the security of these national domains to issue a paper money having a forced circulation and a preference in the purchase of them. In 1792 the estates of the emigrants were confiscated in like manner. Thus was created that seemingly inexhaustible treasury of assignats which brought France so speedily into a financial anarchy worse than any she had yet experienced. Among the further reforms of the church were the reduction of monasteries to one for each municipality, and of bishoprics to one for each department. The bishoprics and curacies were made elective, and all the clergy were required to take an oath of obedience to this civil constitution. This oath was forbidden by the pope, and divided the clergy into *assermentés* and *non-assermentés* (sworn and unsworn); the latter, proscribed and persecuted by the state and followed by all devout Catholics, excited opposition everywhere against the revolution. Among other reforms was the reorganization of the administration of justice. The parliaments were dissolved by indefinite prorogation, the judicial functions were separated from the administrative, district courts were created and judges appointed for ten years, while the uniformity of justice was provided for by the erection of

a *cour de cassation* and a *haute cour de justice*. The formation of a code of civil laws was decreed but not yet effected. The assembly closed with an attempt to recall the émigrés, and it prohibited the re-election of its members. Mirabeau, the greatest orator of the assembly, and one of the boldest leaders of the revolution, had died prematurely, 2d April, 1791, from the excesses of his life.

Two distinguishing features of the revolution, the clubs and an incendiary press, sprung up during the period of this assembly. The clubs, of which the suggestion was borrowed from England, were a result of the rapid fermentation of new ideas. Among the most distinguished of them were the club Breton, which took the name of Jacobin from the convent where it met: its leaders were Lameth, Duport, Barnave, and Robespierre; the club of the Cordeliers, also named from a convent, formed by Danton in 1790; the club of '89, consisting of the moderate reformers, Siéyès, La Fayette, &c.; the Feuillants, founded in 1791 by the royalists, and closed the same year.

The constituent assembly was, according to the constitution, immediately followed by the legislative assembly, which began its sittings on 1st October, but before the period assigned by the constitution it gave place to the convention. In the legislative assembly there were two parties of political importance, the Girondists, who led it, and the Montagnards, who subsequently became all-powerful in the convention. The royalists were already powerless. The Girondists Brissot, Pétion, Vergniaud, &c., were in theory republicans, but they kept terms with the monarchy, and endeavoured to proceed with moderation to the realization of their projects. The assembly was compelled at once to take a decisive course. By the declaration of Pilnitz the Emperor of Germany and the King of Prussia threatened an armed intervention to restore Louis to his rights. The assembly replied by passing severe measures against the *émigrés* and the *prêtres non-assermentés*, and by threatening the foreign powers with revolution instead of arms. The king was compelled in March to accept a Girondist ministry, and on 20th April, 1792, war was declared against the empire. The first attempts to assume the offensive were unsuccessful. The king maintained a treasonous correspondence with the allies, and refused to sanction the decrees of the assembly. On the 20th June, the anniversary of the Jeu de Paume, the people invaded the assembly and the Tuileries, and summoned the king to sign the decrees. He refused, but satisfied them for the moment by allowing himself to be crowned with a red bonnet. On the 26th July the Duke of Brunswick issued his celebrated manifesto, threatening, if the king was insulted, to deliver Paris to a military execution. The sections of Paris retorted by signing a petition demanding the deposition of the king before the close of the day (9th August). At midnight the tocsin sounded. The Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a national convention. The convention was an extraordinary assembly, summoned for an emergency, and thus recognized the fact that France was again without a constitution. The elections were, as a matter of urgency, conducted in the manner prescribed by the constitution, namely, by two stages, but all citizens were admitted to vote in the primary assemblies. Among the members elected 77 had sat in the constituent assembly, 181 in the legislative, and 491 were new. Nearly all were anti-monarchical. On 21st September the convention notified its existence to the legislative assembly, which at once resigned to it its functions.

The war now assumed a more favourable aspect. The victory of Valmy, 30th September, freed France of its invaders; that of Jemmapes, 6th November, led to the occupation of Belgium.

During the first period of the convention the Girondists still held the lead. The first act of the new assembly was to proclaim the republic. On 3d December the king was cited to appear before it. On 20th January, 1793, he was, by four successive votes, sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, Spain, and the empire joined the coalition. A levy of 300,000 men was ordered. It was necessary to send some of these new levies to suppress the Chouan insurrection in Maine, Anjou, and Brittany. Nearly all the officers of rank had emigrated, and Dumourier, after being defeated at Neerwinden (18th March), had declared against the convention. The army lost confidence in its heads and became disorganized. Mutual suspicion and distrust reigned in the convention itself. The convention took measures suited to the gloomy aspect of affairs. A revolutionary tribunal was appointed to try offences against the state, a committee of public safety, with sovereign authority, was appointed (6th April), and the convention renounced the inviolability of its members. The period thus inaugurated is known in history as the Reign of Terror. The struggle between the Girondists and the Montagnards became violent. The latter, defeated in the convention, armed the sections of Paris. The convention, under pressure, ordered the arrest of thirty-one Girondists (2d June). Some of them escaped and excited insurrection in the provinces. A new constitution was adopted by the convention on 23d June, called the Constitution of the Year 1, the Republican Calendar being adopted on 5th October, 1793. In the meantime the majority of the southern towns declared against the convention, the French territory was invaded both on the north and south, and to all these dangers was added famine. The convention fixed a maximum price for the sale of provisions. A decree was passed excluding English manufactures from France. A levy was ordered of 1,200,000 men, and Carnot organized fourteen armies. The revolted provinces were speedily reduced. Bonaparte took Toulon from the English; and Jourdan, as commander-in-chief of the army of the north, was put in a position to oppose the principal forces of the coalition. The energy of the dominant party had risen to the danger, but it was accompanied by a ferocity without example. The revolutionary tribunal had already filled the prisons with victims. On the 17th September a law was passed against suspected persons, which practically proscribed whole classes, and included any one the emissaries of power chose to suspect within its sweep. On 10th October the constitution was suspended and the government declared revolutionary, a term which included unlimited power. Both in Paris and the provinces executions and massacres followed each other daily, and as new parties succeeded each other in the convention the leaders of the defeated parties were added to the usual list of suspected royalists or reactionaries. Thousands of paid committees were formed throughout France. Nantes, Lyons, Toulon, Arras, and others were delivered over to such agents as Carrier, Collot d'Herbois, Couthon, Fouché, Barras, and Lebon, who exhausted their ingenuity in inventing means of wholesale massacre. The queen was

executed on 16th October, the Girondists on 31st October, the Hébertists on 24th March, 1794, the Dantonists on 5th April. Robespierre had a new law passed on the 22d Prairial (10th June) to facilitate these executions, and from this date to 27th July 1400 persons are supposed to have perished. At length the reign of terror came to an end by the execution of Robespierre and his associates on 27th and 28th July.

The campaigns of 1793 and 1794 resulted favourably to the French arms. The Vendean insurrection was reduced from an open to a secret warfare. The allies made war on the old system of position and detail, and permitted the French, by a better concentration of their forces, to gain some decided advantages. Jourdan defeated the Prince of Coburg at Wattignies 15th and 16th October. Hoche wintered in the Palatinate. In Italy and Spain the French had also been able to carry the war beyond their own frontiers. In 1794 Pichegru, by the victory of Fleurus, recovered Belgium, and by the beginning of 1795 had completed the conquest of Holland, which, under French influence, constituted itself into the Batavian Republic. By the successes of Jourdan the allies were driven across the Rhine, and Spain was invaded. These successes induced Prussia and Spain to lay down their arms. By the treaties of Basel, signed by the former on 5th April, by the latter on 12th July (ratified 22d), 1795, these countries acknowledged the French Republic. The English had been successful at sea, and had made extensive captures among the French colonies.

In 1795 the convention gave the republic a new constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients* to approve them, an executive of five members, one elected annually, called the *Directory*. This tame bequest of that once terrible assembly marked the progress of a strong reaction. The royalists conceived sanguine hopes of a restoration. Pichegru was gained, a royalist insurrection organized, and 30,000 men marched on the Tuileries, where the convention sat. Barras intrusted the defence to Napoleon, who, with 5000 men and his artillery, repulsed the insurgents. This event is called the affair of the 13th Vendémiaire (5th October, 1795). Bonaparte was now appointed under Barras to the command of the army of the interior. The convention was dissolved on 26th October. It had prepared a uniform code and organized a system of national instruction, and as the price of its military successes it had destroyed the national credit by the issue of forty-four milliards of assignats. On 1st March, 1796, a louis d'or was worth 7200 francs in assignats, and the armies, after all their successes, were in a state of absolute destitution.

In these circumstances opened the campaign of 1796–97, organized by Carnot. Jourdan and Moreau, each with 70,000 to 80,000 men, were to enter Germany to reach the basin of the Danube, the first by the valley of the Main, the second by that of the Neckar, and to descend upon the hereditary states of Austria; while Napoleon, with 40,000 men, menaced Italy. One object of the campaign was to make the armies live on foreign territories. Bonaparte's lieutenants in Italy were already experienced generals, Masséna, Augereau, Serrurier, Laharpe, Berthier. He assembled them and unfolded his plans, which silenced the jealousy naturally caused by his appointment. On leaving the council Masséna said to Augereau, 'We have found our master.' To the soldiers he issued the first of his rousing proclamations: 'You are ill-fed,' he said, 'and almost naked; the government owes you much, and can give you nothing. I am about to lead you to the most fertile plains in the world, and to opulent cities where you will find honour, glory, and riches.' During four years the army had been struggling against the Sardinian and Austrian troops, without decisive success, on the southern slopes of the Alps and Apennines. The Sardinians stretched from the Bormida to the Stura, with an intrenched camp at Ceva. The Austrians were cantoned in the neighbourhood of Alessandria and Tortona, commanding the roads to Genoa and Milan. Napoleon threatened an attack on Genoa by Voltri, but made his real advance through the valley of the Bormida. By seizing Montenotte he placed himself in their centre; and having first repulsed the Austrians, drove the Sardinians before him to Cherasco, where an armistice was concluded (April 28), which was converted, on 15th May, into a definite treaty, by which Sardinia renounced the coalition and ceded Savoy and Nice to France. Bonaparte now turned upon the Austrians, and by forced marches to Piacenza compelled Beaulieu to retreat towards the Tyrol. He crossed the Po at Piacenza, stormed the Bridge of Lodi, which was held by the Austrians to cover their retreat, and entered Milan on 14th May. Brescia was entered on the 28th, the passage of the Mincio forced at Borghetto on the 30th; and the Austrians, after garrisoning Mantua, retired into the Tyrol. Napoleon followed up his successes by negotiations with the Italian princes and the pope, upon whom he levied contributions. The King of Naples signed an armistice on 5th June. Besides money, so much wanted by the directory, Napoleon provided a pleasing tribute to French vanity by stipulating for the surrender of pictures, manuscripts, and works of art. On Lombardy he levied a contribution of 20,000,000 francs; the pope promised 21,000,000. He sent 10,000,000 to the directory, which had not been able to defray the expenses of his campaign. While he besieged Mantua, a fresh army of Austrians under Wurmser advanced against him in three divisions. He raised the siege, beat one division under Quosdanovich at Salo and Lonato (3d August), and another under Wurmser at Castiglione, on the 5th. Wurmser, reinforced to 50,000 men, again attempted to relieve Mantua. Napoleon, who had entered the Tyrol and had reached Trent after defeating 25,000 Austrians under Davidowich at Roveredo, descended the valley of the Brenta after Wurmser, defeated him at Bassano (September 8), and shut him into Mantua. In the meantime the Archduke Charles had defeated Jourdan and forced Moreau to retreat by the Black Forest to Alsace, which he reached in October. This enabled the Austrians to send a fresh army after Napoleon, consisting of 50,000 men, under Alvinczy and Davidowich. After sustaining a repulse at Caldiero, Napoleon outmanœuvred Alvinczy and defeated him at Arcole, 15th–17th November. In January, 1797, Alvinczy, with large reinforcements, again advanced from Roveredo to the relief of Mantua. Napoleon defeated him on the 14th, at Rivoli. On 2d February he received the surrender of Mantua. Bonaparte now put an end to his armistice with the pope, and invaded the States of the Church. A speedy understanding was come to by the Treaty of Tolentino (19th February); the pope surrendered Avignon, Bologna, Ferrara, and the Romagna to France; these were added to the provinces of Modena and Reggio, taken from the duke, and formed the Cispadane Republic, as, after the battle of Lodi, Lombardy had been proclaimed as the Transpadane Republic. The Austrians were preparing for another invasion of Italy under the Archduke Charles, and Napoleon resolved to anticipate them before they should receive their reinforcements from the armies on the Rhine. He entered the Tyrol, driving the archduke before him, and had reached Judenburg, a few days' march from Vienna, when an armistice was accepted (7th

April), and preliminaries were signed on the 18th, at Leoben, ceding the Austrian Netherlands and Lombardy to France, and indemnifying Austria with Venetia. These preliminaries were confirmed by the Treaty of Campo Formio, signed 17th October.

In the meantime the internal condition of affairs was becoming worse. The assignats had been replaced by mandats on the public territories, which had fallen into the same discredit. The reign of terror had been followed by an excessive dissolution of manners. Brigandage prevailed in the provinces. Barras, a member of the directory, and other high officials, had been guilty of malversation and private jobbing in the public funds. The returned royalists were intriguing for a counter-revolution. The reactionary party had triumphed in the elections of May, 1797, and had succeeded in electing Pichegru president of Five Hundred, and Barbé Marbois, another royalist, president of the Ancients, and had replaced Letournerre in the directory by Barthélemy. The majority of the directory, relying on the support of Bonaparte, resolved to anticipate them. On the night of 4th September, 1797 (18th Fructidor, year 5), Augereau introduced 12,000 men into Paris, surrounded the halls of the councils and arrested the leaders of the reactionary party. The minorities of the two councils, assembled on the invitation of the directors, declared themselves *en permanence*, condemned fifty-three deputies, including the two presidents and the two members Carnot and Barthélemy, forming the minority of the directorate, to transportation; annulled the elections in forty-eight departments, and repealed the laws which had been passed in favour of priests and emigrants; and other violent measures were also taken. Moreau, who had betrayed the intrigues of Pichegru, was himself suspected, and deprived of his command.

Napoleon, who was named General of the Army of England, persuaded the directory to abandon the project of a descent on England, and proposed, as a means of ruining her Indian Empire, the conquest of Egypt. The army appointed for this expedition, consisting of 36,000 men, veterans of Arcole and Rivoli, embarked at Toulon 10th May, 1798, in a fleet commanded by Bruey. A body of artistic and scientific explorers accompanied it. In passing, they took Malta from the knights. While Napoleon was occupied with the conquest of Egypt, Nelson, who had pursued the French fleet, found it moored in the Bay of Aboukir (1st August), defeated, and nearly destroyed it. The French were thus already imprisoned in their conquest, the political value of which was confiscated in advance. After the battle of the Pyramids (July 21) the subjugation of Egypt was easily effected, and early in the following year Bonaparte proceeded to the conquest of Syria. After traversing the desert, and capturing Gaza and Jaffa, where he massacred the garrison, he laid siege to St. John d'Acre, which was defended by a Turkish garrison, assisted by the English commodore, Sir Sydney Smith. After sixty days' siege he was compelled to relinquish the attempt to capture this place and return to Egypt. On 22d August, in consequence of advices from Europe, he abandoned the command of the army to Kléber, and embarking in a frigate landed at Fréjus 9th October.

A second coalition had by this time been formed against France, embracing England, Russia, Austria, and other German states, Naples, Portugal, and Turkey. To meet this danger the councils passed the law of the conscription (5th September, 1798), and ordered a levy of 200,000 men. Championnet conquered Naples, and gave it the name of the Parthenopean Republic, 23d January, 1799. Switzerland had also received a constitution which permitted its military occupation by France; and Genoa and the surrounding territory had been formed, after Napoleon's campaign, into the Ligurian Republic. The Cispadane and Transpadane Republics had been formed into the Cisalpine Republic.

The campaign of 1799 was disastrous to the French. Jourdan, who had crossed the Black Forest, was defeated by the Archduke Charles at Stockach on 25th March, and forced to retire beyond the Rhine. Schérer, who was intrusted with the command of the army of Italy, was defeated at Magnano on 5th April. Moreau, who superseded him, sustained further reverses; and MacDonald, who came to his assistance with the army of Naples, was totally defeated in the battle of the Trebbia, 17th–19th June. Joubert, who succeeded Moreau, was defeated and killed at Novi 15th August. These reverses lost France the territories which had been formed into the Cisalpine Republic. On the other hand, the Anglo-Russian campaign in Holland had failed; and Masséna, after a brilliant campaign in Switzerland, defeated the Russians and Austrians at Zurich on 25th September, which induced the Emperor Paul I. to make peace.

Napoleon, on his return, found the government in great embarrassment. Its credit was wholly gone. It was obliged to fund the interest of its debts or pay it in worthless paper money, and was reduced to the necessity of levying forced loans at home, while its agents pillaged the dependent republics. It was ill-obeyed by its generals. Championnet and Brune imprisoned its representatives. A revolution had taken place in the government (18th June), but the new directors were as incompetent as the old. In these circumstances was accomplished the revolution of the 18th and 19th Brumaire (9th–10th Nov. 1799). The councils being alarmed with rumours of a Jacobin plot, the Ancients gave orders that both bodies of the legislature should be transferred to St. Cloud under the conduct of Bonaparte, who was intrusted with the command of the troops. Bonaparte had already secured the co-operation of Moreau and the other generals present in Paris. On the 10th Napoleon entered the council of the Ancients assembled at St. Cloud, and insisted on the necessity of a new constitution. On proceeding to the council of the Five Hundred he was received with cries of *à bas le dictateur*. General Leclerc, by his orders, entered and and dispersed the assembly. The members of the two councils who were favourable to Bonaparte then appointed a provisional government of three consuls—Bonaparte, Siéyès, and Roger Ducos, and a committee consisting of twenty-five members of each council to draw up a new constitution.

The constitution was proclaimed on 15th December. The three consuls were appointed for ten years, and re-eligible. The first had all the executive powers, the others only a consultative voice. The laws, prepared by a *conseil d'état*, nominated by the consuls, were to be discussed by a tribunate of 100 members, and voted or rejected by a *corps législatif* of 300 deputies; three members of the conseil d'état were to defend the measures brought before the corps législatif, and three members of the tribunate were either to oppose or confirm them. The corps législatif could not debate. A senate composed of eighty members, not under forty years of age, and appointed for life, was to select from lists prepared by the electoral colleges the members of the tribunate and corps législatif. All Frenchmen of twenty-one years of age, domiciled for a year, and inscribed on the civic registers, were entitled to vote. The electors of each arrondissement chose a tenth of their number to form a list of communal notabilities, and from this list the

first consul chose the public functionaries of the arrondissement. The citizens on the communal list chose a tenth of their number for the departmental list, from which the functionaries for the department were chosen. The citizens on the departmental list chose a national list, from which the national public functionaries were chosen. This constitution was submitted to the approbation of the people, and accepted by 3,011,107 suffrages against 1567. The constitution was said to have been drawn up by the Abbé Siéyès. However this may be, nothing could have been better adapted for giving a despotic power to the head of the executive, who had, in the lists of Notables, perfect liberty of choice, while the electors were entertained with the charge of drawing up a classified series of local directories for his use. The departments were put under prefects directly responsible to the minister of the interior. The prefects, sub-prefects, and maires of communes had all their councils, which were merely consultative, the whole executive power being in the hands of the officer responsible to government. This centralization of the powers of government has survived all revolutions, which, by vesting all powers in the capital, it has done not a little to promote.

Bonaparte chose Cambacérès and Le Brun as second and third consuls. He revoked the conscriptions, and made efforts to conciliate both royalists and Jacobins. He wrote letters to the King of England and the emperor urging, in theatrical terms, the restoration of peace. Louis XVIII. wrote to Napoleon suggesting his own restoration. Napoleon was too much occupied to pay due attention at this time to the royal request, but he is said to have retaliated in 1804 by asking Louis to cede in his favour the rights of the house of Bourbon. The Chouan insurrection, which had again broken out, was suppressed. Credit revived with the restoration of order and the prospect of a strong government.

Napoleon's overtures of peace being refused, his next business was to prepare for war. He gave Moreau the command of the army of the Rhine, and determined himself to proceed to Italy. Masséna, with the remains of the French army, was shut up in Genoa. He crossed the Alps, and defeated the Austrians at Marengo on 14th June, 1800. By the Convention of Alessandria, signed on the 16th, Melas abandoned all Piedmont and Lombardy, to the Oglio. Napoleon then committed the command to Masséna and returned to Paris.

Moreau defeated the Austrians in several engagements during May, and forced them to take refuge in Ulm. The rest of the year was divided between campaigning and negotiating; but the latter having proved fruitless, Moreau again defeated the Austrians under the Archduke John, on 3d December, in the decisive battle of Hohenlinden. Brune, who succeeded Masséna, extended the Italian conquests in Tuscany and Venetia. Negotiations were then entered on by Austria, and the Peace of Lunéville concluded 9th February, 1801. The Rhine was recognized as the boundary between France and Germany. The Adige was to be the boundary of Austria in Italy. The independence of the Batavian, Helvetian, Cisalpine, and Ligurian Republics was guaranteed. A treaty was also concluded with Spain at Madrid on 21st March; and by the Treaty of Florence, 28th March, Naples agreed to renounce the coalition, and received French garrisons. Russia, Prussia, Denmark, and Sweden, formed an armed neutrality in opposition to the naval privileges claimed by England, which now maintained the war single-handed. This led to a brief war between England and the northern powers, except Prussia, which was terminated by the death of Paul I. On 31st August General Menon, by a capitulation with the English, agreed to evacuate Egypt. Both England and France were now anxious for peace. Preliminaries were signed on 1st October, and the Peace of Amiens was concluded 27th March, 1802. France retained her continental conquests. Ceylon was ceded to England by Holland, and Trinidad by Spain; all the other conquests of Great Britain were restored. Malta, which had been taken by the English, was to be restored to the Knights of St. John.

Napoleon exhibited his wonted vigour in home administration. By means of the senate he silenced the opposition of the tribunate and the corps législatif. He superintended the preparation of the Code Civil. He entered into a concordat with Cardinal Consalvi for the re-establishment of the Catholic religion. He undertook public works, constructed roads and bridges, encouraged agriculture, manufactures, and commerce. On 2d August, 1802, Napoleon and his colleagues were made consuls for life, and the constitution was amended. The senate was enabled by the issue of *senatus consulta* to create organic laws, and to suspend the other bodies; the tribunate was reduced to fifty members and became a mere section of the conseil d'état. A privy-council was constituted, and the lists of Notables were replaced by electoral colleges chosen for life. This constitution was confirmed by another popular vote. The Cisalpine, now called the Italian Republic, had elected Napoleon its head. The Ligurian Republic allowed him to nominate its doge. Piedmont, united to France, formed seven new departments (11th September).

The external policy of Napoleon was not calculated to conciliate the jealousies caused by the extension of French dominion. The independence of the new republics was merely nominal. The Duchy of Parma and the island of Elba were occupied, and an armed intervention changed the government of Switzerland. By the Treaty of Lunéville the German princes dispossessed by the advance of the French boundary were to be indemnified beyond the Rhine. The process of compensation was not carried out with sufficient promptitude for Napoleon. By his interference, in conjunction with that of the Emperor of Russia, the indemnification was effected by the extinction of the two electorates of Cologne and Trèves, and the secularization of the ecclesiastical estates. Napoleon occupied St. Domingo, and sold Louisiana to the United States for 60,000,000 francs.

The discontent excited in England by this aggressive policy made it evident that the peace could not be maintained, and the government refused to evacuate Malta. On 16th May, two days before the declaration of war, an embargo was laid on all French and Dutch vessels in English harbours. Napoleon retaliated for this lawless proceeding by seizing as hostages all English travellers in France and Holland, and detaining them as prisoners till the peace, and General Mortier took military possession of Hanover. Russia and Prussia attempted to intervene, but on terms unacceptable to France. Spain and Portugal had to purchase their neutrality from France; but as this purchased neutrality placed the former at the disposal of France, England declared war with Spain. Naples was occupied by French troops, and vast preparations were made ostensibly for the invasion of England.

A conspiracy for the overthrow of Bonaparte and the restoration of the Bourbons was discovered in 1804, in which the British government was implicated. The most distinguished of the conspirators were Georges Cadoudal, the Chouan chief, Pichegru, and Moreau. Cadoudal was executed, Pichegru destroyed himself in prison, Moreau was pardoned, and retired to the United States. The Duke d Enghien, sus-

pected of complicity in this intrigue, was arrested in neutral territory, in the Grand-duchy of Baden, brought to Vincennes, and executed.

The legislative bodies were now completely subservient to Napoleon, and the conspiracy of Cadoudal was made a pretext for offering him the empire, in order to assure the permanence of the government by giving it a hereditary head. The senate addressed him by a deputation, and on being invited to express their opinion voted the hereditary empire with four dissentient voices, among whom were Siéyès and Volney. In the council of state seven members supported the republic; in the tribunate there were only a few dissentients, among whom was Carnot. The *senatus-consultum* for the regulation of the empire, drawn up by Napoleon himself, was passed 18th May, 1804. The empire was confirmed by a popular vote of 3,572,329 against 2569.

The empire was made hereditary in the male issue of Napoleon and his adopted sons, his brothers Joseph and Louis following in the order of succession. The emperor was to have absolute authority over the imperial family. A civil list of 25,000,000 was assigned to the emperor, and 1,000,000 to each prince. A new aristocracy, not yet hereditary, was created. After the emperor came the grand dignitaries of the empire. The grand-elector (Joseph) was to convoke the legislative bodies; the arch-chancellor of the empire (Cambacérès) to superintend the courts of justice; the arch-chancellor of state to preside over the diplomacy of the empire; the arch-treasurer (Lebrun) over its finances; the constable (Louis Bonaparte) over the army; the grand-admiral over the fleet. These formed, in case of a minority, the council of regency. Two places were left vacant for two brothers of Napoleon in disgrace. A list of grand officers, also appointed for life, to the number of forty to fifty, followed. It included sixteen marshals of the empire (fourteen named), some special military and naval appointments, a grand-chamberlain (Talleyrand), grand-master of the hounds (Berthier), grand-equerry (Caulincourt), grand-marshal of the palace (Duroc), grand-master of ceremonies (De Ségur). The fourteen marshals were—Augereau, Bernadotte, Berthier, Bessières, Brune, Davout, Jourdan, Lannes, Masséna, Moncey, Mortier, Murat, Ney, Soult; Kellermann, Lefebvre, Perignon, and Serrurier were made honorary marshals. The senate, besides eighty members elected by itself, was to comprise the six grand dignitaries of the empire, and the princes of the blood after eighteen years of age. A high imperial court was constituted to take cognizance of crimes against the safety of the state, the person of the emperor, and of offences committed by ministers or great persons of the state. On 4th July Napoleon distributed at the Hôtel des Invalides the grand decorations of the Legion of Honour, instituted two years before, to the chief personages of the empire. On the 16th of August he gave the crosses of the Legion to the soldiers in the camp of Boulogne, where in sight of the English fleet the preparations were going on for the invasion of England. The Channel, he afterwards observed, is a ditch which will be cleared when we have the audacity to try it. The pope was invited to the coronation of Napoleon, which took place at Notre Dame on 2d December, 1804. The emperor, after receiving the sacred unction from the pope, crowned himself, and afterwards the empress. On 26th May, 1805, he was crowned King of Italy.

Pitt had in the meantime been organizing another coalition against France. A treaty was concluded between England and Sweden on 3d December. The Emperor Alexander, who had in the previous year strongly remonstrated against the usurpations of the French government, and withdrawn from diplomatic relations with it, joined the allies on 11th April, 1805. Austria, which had long taken part in the consultations of the league, formally acceded to it on August 9. Austria had delayed to the last her adhesion to the coalition, because on her the brunt of the war was certain to fall. Prussia remained neutral. Austria opened the campaign with a powerful army in Italy under the Archduke Charles, and a German army under General Mack. A Russian and Swedish army was to operate in North Germany, and two Russian armies of 60,000 each were to join Mack on the Danube. The Austrian army crossed the Inn and entered Bavaria, which was in alliance with France, on September 9. Mack, who had about 80,000 men, without waiting for the Russians traversed Bavaria and took up a position on the Iller. Napoleon, who had resolved to deliver his principal attack in Germany, where the Austrians were weakest, turned Mack's right and crossed the Danube in his rear, and having cut off his communications shut him up in Ulm. Defeated in his attempts to escape the toils, particularly by Ney at Elchingen (14th October), Mack capitulated with all his forces on 19th October. On 13th November Napoleon entered Vienna, where he found himself between two armies. On the right that of the Tyrol and Italy, which the Archduke Charles had led back in consequence of Mack's disaster, followed by Masséna, on the left the Austro-Russian main army with the two emperors (Austria and Russia) in Moravia. He moved immediately against the latter, and arrived at Brünn on 20th November, encountered the Austro-Prussian army, which was superior in number, at Austerlitz on 2d December, and inflicted on it a decisive defeat. An armistice was immediately concluded, and the Peace of Presburg, between France and Austria, signed on 26th December. Austria surrendered Venetia, Istria, and Dalmatia to France, the Tyrol to Bavaria, and Suabia to Würtemberg and Baden. The title of king was assumed by the Electors of Bavaria and Würtemberg, and of grand-duke by the Elector of Baden. Napoleon was now able to carry out the plan he had contemplated of giving his empire a hereditary nobility. Joseph Bonaparte was created King of Naples and Sicily; Louis, King of Holland; Eliza, Duchess of Lucca; Pauline, Duchess of Guastalla; Talleyrand, Prince of Benevento; Bernadotte, of Pontecorvo; Berthier, of Neufchâtel; Murat, Grand-duke of Berg. Other territorial titles were bestowed upon his marshals and generals, and domains with hereditary succession set apart for their maintenance. While this great success was being achieved, Nelson in the battle of Trafalgar, 21st October, 1805, had almost annihilated the French and Spanish fleets. The Confederation of the Rhine, a league of German princes, under the protection of France, was signed at Paris on 12th July, 1806. On 6th August Francis II. abdicated the title of Emperor of Germany, the empire having been *de facto* dissolved.

Negotiations had been going on for peace with Russia; but the dissolution of the German Empire determined Alexander to continue the war. The formation of the Confederation of the Rhine was also looked upon as an affront by Prussia, and when Napoleon offered to restore Hanover, which he had bestowed on Prussia as the price of peace to England, the king and people were filled with rage, and war was determined on regardless of the hazardous circumstances in which it was undertaken. War was declared on 8th October. Napoleon was already at Bamberg directing his troops which had not left Germany. On the 14th the two armies met at Jena and Auerstädt, when the Prussians were totally defeated.

Napoleon entered Berlin on 27th October. Here he dictated on 21st November the celebrated decree declaring the British Isles in a state of blockade. All commerce in English articles was forbidden, all Englishmen on the Continent were rendered liable to arrest. A Russian army, about 90,000 strong, had already entered Prussian Poland. Napoleon arrived at Warsaw on 15th December, but nothing decisive occurred till the beginning of the year. The battle of Eylau, which was claimed as a victory on both sides, but which checked Napoleon's progress, was fought on 8th February, 1807. The surrender of Dantzig having relieved a large body of French troops engaged in besieging it, a new campaign was begun, and on 14th June a decisive victory was gained by the French at Friedland. Separate armistices were immediately entered into with Russia and Prussia, and the Peace of Tilsit was concluded 7th–9th July. Prussia was compelled to cede nearly the half of her territory. The Kingdom of Westphalia was formed for Jerome Bonaparte of Hesse Cassel and the Prussian provinces west of the Elbe; the Grand-duchy of Warsaw for the King of Saxony of the Polish provinces of Prussia—some minor cessions were made in favour of Russia and other powers, and the Prussian army was restricted for ten years to 42,000 men. Russia recognized the new kingdoms created by Napoleon, and the Ionian Republic, of which Russia had guaranteed the independence, was given up to France. To secure the connivance of Alexander in his ambitious designs, and especially his co-operation against England, Napoleon gave up Finland to Russia, and she was encouraged to hope for the Danubian provinces of Turkey. Napoleon's idea seems to have been that the two emperors should divide between them the dominion of the civilized world; but he soon showed that he could not admit a partner except as a dependant. In the meantime the mediation of Russia was formally accepted for the negotiation of a peace with England, and that of France for a peace between Russia and Turkey; failing these, an offensive and defensive alliance was concluded, and a rigorous enforcement of the continental blockade was imposed both on Russia and Prussia.

While these events were going on the internal improvement of France had not been neglected. Paris had been adorned with numerous and splendid works of architecture, and supplied with water by the Canal d'Ourcq; roads had been made in La Vendée, across the Simplon, Mount Cenis, Mount Genèvre, &c.; the port of Cherbourg had been excavated. Canals from Nantes to Brest, and from the Rhine to the Rhone, opened up important lines of interior navigation, and industry and commerce were encouraged. Among the glories of the Napoleonic epoch, however, cannot be placed that of literature. The hand of despotism pressed too heavily on the nation to permit of freedom of thought, and the constant drain of the youth of the country by the conscription was a heavy charge for a material progress which was being thus rapidly undermined.

The Peace of Tilsit led immediately to war between England and Denmark. Assured that the latter could not maintain her neutrality, the former insisted upon an alliance by which Denmark should be placed under the protection of Great Britain, her fleet carried to England for security, and her territory guaranteed. These extraordinary demands, which nothing but an extreme exigency could justify, were not complied with. Copenhagen was bombarded by the English fleet for three days, from 2d to 5th September, and the Danish fleet and naval stores carried to England. The war between England and Denmark continued till 1814. Russia offered her mediation to England, but declined, on the invitation of the English cabinet, to communicate the secret articles of the Treaty of Tilsit, and re-proclaimed the armed neutrality. War was consequently declared, and for five years Russia continued in the French alliance, and in hostility with England.

Portugal had generally joined the confederacies against France, and Napoleon now determined to occupy it, with the intention also of overthrowing the government of Spain, which he could not trust; but in the meantime he entered into an alliance with Spain for the partition of Portugal. Junot entered Lisbon, 30th November, 1807, with the advance-guard of the French army. The pope being unwilling to carry out the continental blockade, and refusing to recognize Joseph as King of Naples, Rome was occupied, 2d February, 1808. The French troops had already entered Spain before the end of 1807; and in March, 1808, Murat with 100,000 men marched upon Madrid, which was entered on the 23d. By the Treaty of Bayonne, signed 5th May, Charles IV. resigned the crown of Spain, which Napoleon gave to his brother Joseph. The sovereignty of Naples was bestowed upon Murat. The Spaniards, whose government had been disposed of without their consent, everywhere rose in insurrection, and the military occupation of all the provinces of Spain became a necessity. The French troops met with various reverses. At Baylen, on 22d July, Dupont was compelled to capitulate with 18,000 soldiers. A British force, under Sir Arthur Wellesley, landed at Mondego Bay, defeated Junot at Vimeira, August 21, and compelled him to evacuate Portugal by the Convention of Cintra on the 30th. The progress of the Spanish insurrection brought Napoleon with fresh forces to Spain, and after successful engagements at Burgos, Espinosa, and Tudela, he entered Madrid on 2d December. He immediately decreed the abolition of the inquisition, the suppression of two-thirds of the convents, the cessation of feudal rights, and the abolition of internal customs. Catalonia was overrun by St. Cyr, while Soult expelled the English under Sir John Moore from Portugal (Coruña, 16th January, 1809).

The occupation of Napoleon in Spain gave Austria the opportunity she awaited of breaking the Peace of Presburg. On 27th March, 1809, a declaration of grievances suffered since the peace was delivered to the French government, and on 10th April the Austrian army crossed the Inn and occupied Bavaria. Napoleon, who had returned from Spain to prepare for the encounter, defeated the Austrians at Eckmühl on 22d April, and immediately advanced to Vienna. The Arch-duke Charles after his defeat also marched towards Vienna on the opposite bank of the Danube, and took up a position a short distance to the north of the capital. The French seized the island of Lobau, and throwing a bridge across the Danube, encountered the Austrians in the bloody and indecisive battles of Aspern and Essling. The French were forced after great loss to return to the isle of Lobau, which Napoleon fortified, and awaited the approach of Eugene with the army of Italy. On 5th July he debouched with 150,000 men on the left bank, and on the 6th defeated the Austrians in the battle of Wagram. An armistice was signed at Znaim on 11th July, and on 14th October, 1809, was signed the Peace of Vienna (Schönbrunn), in which the cessions of the Treaty of Presburg were confirmed, and further cessions of territory made to France and her allies. An English expedition of some magnitude, known as the Walcheren Expedition, which might have had a powerful effect in Germany, misdirected against Antwerp, failed of effecting anything, and re-embarked in December.

Napoleon was divorced from Josephine on 15th

December, and married Maria Theresa of Austria by proxy, 11th March, 1810. The 'King of Rome' was born, 20th March, 1811.

The war continued in Spain throughout all the provinces. Saragossa had surrendered after a memorable siege on 20th February, 1809. The mutual jealousy of Napoleon's marshals, bound to the service of an ambitious master rather by the tie of self-interest than of patriotism, always interfered in his absence with the unity of their operations; but the force wielded by them was too great for the undisciplined and ill-organized bands of the Spanish junta. In Portugal a somewhat better organization prevailed. A forced levy was made, and twenty-four regiments were taken into British pay. Sir Arthur Wellesley landed at Oporto with an English force on 22d April, 1809, and uniting with the Portuguese under Beresford, compelled Soult to evacuate Portugal. He then formed a junction with the Spanish general Cuesta, and marched on Madrid. He met the forces of Joseph under Victor and Jourdan at Talavera de la Reyna, 27th–28th June, and defeated them; but the advance of Soult, Ney, and Mortier to the protection of the capital compelled him to retreat to Badajoz.

In 1810 Napoleon, freed from other wars, had concentrated an overwhelming force in the Peninsula, and Wellington defended himself in his famous lines of Torres Vedras, near Lisbon, into which he retired in October, after contesting every position on the way. He was followed by Masséna, who, in the beginning of March, 1811, was compelled to retire by want of provisions. Wellington followed, and defeated him at Fuentes de Onoro on 3d and 5th May. On 16th May Soult was defeated by Beresford at Albuera. Suchet had in the meantime been carrying on a successful war in Catalonia, and earned his marshal's baton by the capture of Tarragona. Wellington captured Ciudad Rodrigo on 19th Jan. 1812, defeated Marmont at Salamanca on 22d July, and entered Madrid on 12th August. While these events were going on, war was preparing elsewhere on a larger scale. Napoleon, with all his clear-sightedness and strength of mind, had not escaped the intoxication of success. After Wagram, Cambacérès observes, 'il avait l'air de marcher au milieu de la gloire.' The continental system had been insisted on with such rigour that his brother Louis resigned the throne of Holland, 3d July, 1810, rather than carry out his instructions, and Holland had been united to France. The Milan decrees (17th Dec. 1807) declared every vessel which had touched at an English port to have lost its nationality, and ordered all English merchandise found on the Continent to be burned. The Hanseatic towns—Bremen, Hamburg, and Lubeck—were added to the empire by decree of 13th December, 1810. It now became more than ever an object with Napoleon to shut the ports of Russia, and he insisted upon this in as harsh and arbitrary a manner as if Alexander had been his vassal. So oppressive had the system become that Napoleon himself had been compelled to issue licenses for trade between France and England. From the close of 1810 Russia had partially departed from the blockade by admitting colonial produce in neutral vessels. Napoleon demanded that such vessels should be confiscated. Russia, he said, must return to the position of subordination in which it was placed by the Treaty of Tilsit. The czar on his part had many grievances. He had entered into an alliance with Sweden, of which country Bernadotte had been elected crown-prince, and secured peace with Turkey; and on 8th April, 1812, he demanded the evacuation of Old Prussia, the duchy of Warsaw, and Swedish Pomerania, and a relaxation of the continental system.

In the war now imminent Prussia and Austria entered on compulsion into the alliance of France, with the obvious intention of deserting her whenever she should meet with serious reverses. The alternative with Austria was alliance or disarmament, and she supported France with a portion of her forces in order that she might be able at the proper moment to turn against her with the whole.

On the 16th of May Napoleon arrived at Dresden, and took up his residence at the royal palace, where he was waited on by the Emperor of Austria, the King of Prussia, and other German princes, who expressed the utmost devotion to him. Negotiation having proved fruitless, he made here his final arrangements for the campaign. The army he had organized for it has been estimated at from 640,000 to 680,000, including auxiliary forces. The principal army of the Russians, 130,000 strong, under Barclay de Tolly, was to cover the route of St. Petersburg, resting on the Dwina; another, under Bagration, to cover Moscow on the line of the Dnieper, and threaten the flank of the invading army.

Napoleon crossed the Niemen at Kovno on 24th June, and entered Vilna on the 28th, where he was detained seventeen days arranging the commissariat of his army. He beat the rear-guard of Barclay's army at Ostrovno, 25th July, and occupied Vitebsk on the 28th. Smolensk, where Barclay had formed a junction with Bagration, was captured on 17th August. The army now advanced towards Moscow; and Kutusoff, who had superseded Barclay, gave battle at Borodino on 7th September, to defend the ancient capital of Russia, when he was defeated with a loss of nearly 30,000 to the victors, and almost double that number to the vanquished. After this fatal battle the French entered Moscow on the 15th, but during the night the city, which had been deserted by its inhabitants, was found to be in flames. The conflagration lasted five days, and destroyed a great part of the city. Napoleon now attempted to negotiate with Alexander, but without result. It was impossible to pursue the Russians further, and the capture of their capital had not produced the moral effect he anticipated. Nothing remained but to retreat. He left Moscow on 19th October with 80,000 men, leaving 10,000 behind as a garrison. At Malo-Jaroslavitz, on the 24th, he had a sanguinary conflict with the Russians. On 5th November, when the army had reached Dorogubush, intense cold set in, and from this point thousands perished on the way. On 9th November only 40,000 to 50,000 men reached Smolensk, and the arrangements which Napoleon had made for victualling the army had not been carried out. Three Russian armies threatened to cut off the passage of the Berezina, which was effected with heavy loss on the 27th. At Smorgoni Napoleon quitted the army to return to Paris, leaving Murat to conduct the retreat. The remains of the army recrossed the Niemen on 20th December. Ney, who commanded the rear-guard, was the last to cross the Bridge of Kovno.

The return of Napoleon to Paris was necessitated by the impending formation of another European coalition. Austria, Russia, and Prussia had successively looked on, while each in turn had sacrificed itself to the divided counsels inspired by dread of French ascendency and of the genius of Napoleon; but now when Russia had set the example of a heroic defence, a really European combination was to be formed against the common oppressor.

A formal declaration of war was made by Prussia on 27th March. Napoleon, availing himself of the wonderful command which the French system of conscription gave him of the resources of the country, raised a new levy of 200,000 men, and was ready before

the allies. He assumed the command of the army at Erfurt on 25th April. He had still 350,000 men in Germany, and Austria did not yet deem it prudent to join the coalition. He defeated the allies at Lützen, 2d May, forced them to cross the Elbe, and entered Dresden on the 8th. On 21st May he again defeated them at Bautzen, and reached Breslau on 1st June. On the 4th he concluded an armistice for six weeks at the village of Poischwitz, near Jauer, in Silesia. As his preparations were more forward than those of the confederates, and his allies could only be depended on in the event of success, this step was of fatal omen. Little could be hoped for from negotiation, and it was already certain that he should have Austria to reckon among his enemies. A congress under the mediation of Austria was opened at Prague on 26th July, but it only resulted in the foregone conclusion of the accession of that power to the coalition. By the Treaty of Töplitz, signed 9th September, a formal alliance was entered into between Austria, Russia, and Prussia; but on the reopening of the campaign, 16th August, they had already arranged a joint plan of operations, and appointed Prince Schwarzenberg commander-in-chief of their combined forces. The allies could now bring from 500,000 to 600,000 men into the field, while Napoleon commanded about 360,000. The whole operations, of course, were extended over a vast area, but the main army of the allies advanced upon Dresden. The battle of Dresden, 26th–27th August, was again a victory for Napoleon, but fatal mistakes were committed, and disastrous defeats of separate corps sustained after it. The surrender of Vandamme in particular, with the remains of a corps of 30,000 men, more than counterbalanced the victory. A large portion of the French armies was composed of German troops, who were daily deserting to the enemy. On October 1st Bavaria seceded. The allied armies were gathering near Leipzig. In these circumstances Napoleon abandoned Dresden, and concentrated his army about Leipzig (15th October). He held this city with 190,000 men, while the allies with about 330,000 formed a semicircle around him. After some preliminary fighting, not disadvantageous to the French, on the 16th, the great battle of the campaign was here delivered on the 18th and 19th. Early on the first day the Saxons and Würtembergers passed over to the allies on the field of battle—a species of treachery which no circumstances can justify. On the second day the French fought only to cover their retreat, which was made more disastrous by the want of bridges over the Elster. This victory of the allies led to the retreat of the French over the Rhine, which was not effected without further combats. The fortresses held by them in Germany and Poland, which occupied 100,000 men, were gradually reduced.

Wellington in the meantime had continued his successes in the Peninsula. He defeated Jourdan on 21st June, 1813, and followed Soult, who succeeded him, after a series of successful engagements, to Bayonne, which he invested in December.

The southern territory of France was thus actually invaded, when, in 1814, the allies prepared for its invasion from the north. Napoleon on his return had made vigorous preparations for the invasion, and had ordered a fresh levy of 300,000 conscripts. A voice, however, had been found even in France and in the servile corps législatif to complain of despotism and perpetual war. The allies crossed the frontier in two bodies—the army of Silesia, under Blücher, crossing the Rhine; the grand army, under Prince Schwarzenberg, passing through Switzerland. Both armies entered France in January. Napoleon's defence ranks among the most skilful of his many campaigns; but in spite of the desperate combats delivered at Vitry-le-Français, St. Dizier, Brienne, Montmirail, Arcis-sur-Aube, &c., the allies steadily advanced, and after a combat sustained in its defence by Marmont and Mortier, Paris surrendered on 31st March. Napoleon abdicated in favour of his son (6th April), but the allies required an unconditional surrender, and assigned him the sovereignty of the Isle of Elba, to which he was conveyed in a British vessel (April 20–May 4). Louis XVIII. was now proclaimed King of France, and a constitution having been arranged, the Peace of Paris was signed 30th May, and the allies immediately evacuated France.

The successes of Napoleon had disorganized the whole of Europe, and a congress had assembled at Vienna to adjust the claims of the various powers, when it was announced that Napoleon had left Elba, returned to Paris (20th March, 1815), and been reinstated without resistance in his former authority. Hereupon the allied sovereigns declared him an outlaw and a disturber of the peace of the world, and renewed their alliance against him.

Napoleon had proposed to remain at peace and govern constitutionally, but his past achievements afforded no guarantee for the safety of this experiment, and he was not allowed to make it. As it was evident the allies would bring a preponderating force into the field, his only chance was to anticipate them. On 15th June he crossed the Sambre with 130,000 men to attack the English and Prussians, who were preparing to invade France on the Belgian frontier while the Austrians attacked it on the Rhine. He encountered the Prussians under Blücher at Ligny, while Ney held the English in check at Quatre-bras (16th June). Blücher was forced to retreat, and Napoleon marched against the English, who had taken position at Waterloo. Here, on the 18th, was fought the decisive battle which resulted in his final overthrow. The allies advanced without opposition to Paris. Napoleon again abdicated in favour of his son (22d June), but being threatened by Fouché, who had assumed the direction of the government, he surrendered to the British (5th July). He was sent by the decree of the allies to St. Helena, where he died 5th May, 1821.

A convention was signed by Davout (July 3), by which the French army was to retire behind the Loire, and the allies entered Paris. Louis XVIII. was again proclaimed, and the allies continued in military occupation of France till 1818. By the first Treaty of Paris (30th May, 1814) France was reduced to her limits of 1792, with the addition of a part of Savoy, and some cantons added to the departments of the Ardennes, Moselle, Bas-Rhin, and Ain. She recovered her colonies with the exception of Tobago, Sta Lucia, and the Isle of France (Mauritius). By the second Treaty of Paris between France and the allies she lost Philippeville, Marienburg, the Duchy of Bouillon, Saarlouis, Saarbrück, the two banks of the Sarre, the country north of the Lauter and part of the county of Gex; and the Holly Alliance entered into between Russia, Austria, and Prussia became for a time a guarantee against future aggressions.

Louis XVIII. at first governed with the support of a moderate Liberal party, but the assassination of the Duke of Berri, 13th Feb. 1820, threw him into the hands of the reactionary party. The ministry of Villèle allied itself with the clergy to restore the royal authority in its ancient prerogatives. Secret societies (see CARBONARI) began to spread in France, with ramifications in Germany and Italy, where despotic governments also prevailed. Several insurrections took place, and some of the leaders suffered capital punishment. This ministry also undertook an expedition to Spain, to repress the opposition

of the Liberals of that country to Ferdinand VII. (1823).

Louis VIII. died 16th September, 1824, and was succeeded by his brother Charles X., who had always been the head of the ultra-royalist party. In 1827 a joint expedition was undertaken by England, France, and Russia in favour of the Greeks, who had thrown off the yoke of Turkey. The elections of 1827 gave a majority to the Liberals, and a moderate government was formed under Martignac. It was displaced by the Polignac ministry, a reactionary government, in August, 1829. An expedition was sent against Algiers under Count Bourmont, which captured the city 5th July, 1830, and formed the beginning of the French colony of Algiers. On 26th July ordinances were published suppressing the liberty of the press, and creating a new system of elections. An insurrection in Paris during the three days 27th–29th July overthrew the royalty of Charles X., and Louis Philippe was proclaimed king, 9th August, 1830.

The appointment of Louis Philippe by the chamber of deputies was peculiarly acceptable to the bourgeoisie or middle classes, and, notwithstanding some occasional outbursts of republicanism, the insurrection in favour of the infant prince called Henry V., and known under the title of Count de Chambord, which was headed by his heroic mother, the Duchess de Berri, and two abortive attempts to grasp the reins of power by Louis Napoleon, the July monarchy, as it was called, lasted eighteen years. It was the policy of Louis Philippe to amuse the populace and flatter the national vanity by active foreign intervention. In 1832 an expedition was sent out to drive the Dutch garrison out of the citadel of Antwerp, which should have been given up to Belgium by Holland in accordance with the Treaty of London. After an obstinate siege the French gained possession of the citadel. In the same year France seized Ancona to counterbalance the influence of the Austrians in Italy, and in 1835 the Algerine war was successfully terminated by the costly acquisition of Algeria. But by degrees the policy of the citizen king, as he was called, was changed; the government proved reactionary at home and devoid of energy abroad; the material prosperity which had marked a great part of the reign was suddenly checked by the scarcity of the harvests and the high prices of 1847. In the middle of that year Guizot, the king's chief minister, declared himself as averse to all organic changes in the state while a strong opposition was insisting on reform. At last, on the 24th Feb. 1848, another bloody revolution broke out by which the Orleans family was exiled. A republic was set up without consulting the voice of the country at large. The bourgeoisie would have undoubtedly preferred the continuation of a constitutional monarchy, but for a time sailed with the stream and professed their readiness to give the republican form of government a fair trial. In the course of a few months, however, their representatives in the constituent assembly, frightened by socialistic movements, gave marked evidence of their strong opposition to it. A so-called republican constitution was adopted, and on the 10th Dec. 1848 Louis Napoleon was elected president of the French Republic for a term of four years by a majority of more than 4,000,000 over General Cavaignac.

The president immediately set about gaining the favour of the army, in which he was completely successful, and when the dissensions in the legislative assembly became apparently dangerous to a continuance of his arbitrary power he dissolved it, 2d Dec. 1851, and appealed to the people, asking their sanction for what he had done. Various ill-concerted attempts at armed resistance were repressed by energetic and bloody measures, and the president, who had all the elective machinery of the nation completely under control, was confirmed in his office for a further term of ten years by 7,839,216 votes; and a new constitution similar to that of the Napoleonic consulate of 1799 was promulgated. At length, on the 7th Nov. 1852, a senatus consultum proposed the re-establishment of a hereditary empire, and another appeal was made to the nation under the same coercive system and with similar success. On the 2d December, strengthened by the votes of 7,824,129 citizens, the empire was proclaimed and Louis Napoleon declared emperor under the title of Napoleon III. In 1853, Russia having invaded the provinces of Moldavia and Walachia under the pretext of securing protection for the adherents of the Greek Church against Turkish intolerance, France and England, having guaranteed the integrity of the Ottoman Empire, declared war against Russia on the 27th April, 1854, and sent a combined fleet to the Black Sea. The Anglo-French armies were landed in the Crimea, 14th Sept. 1854, and the battles of the Alma (20th Sept.), of Inkermann (5th Nov.), and, finally, the capture of Sebastopol (8th Sept. 1855), led to the Treaty of Paris (30th March, 1856), which secured in a great measure the objects for which the allies had gone to war. The Austrian invasion of the Sardinian states, in 1859, brought France once more into the field, as an ally of the latter. The victories of the Franco-Piedmontese armies at Montebello (20th May), Magenta, Marignano, and Solferino (4th, 8th, and 24th June) deprived Austria of Lombardy, which was ceded to Piedmont. The French obtained, as a recognition of their powerful assistance, the territories of Savoie and Nice (10th March, 1860). In 1860 the French sent out an expedition to China to act in concert with the British, who were determined to enforce the Treaty of Tien-tsin, by which provision had been made for the permanent residence of their ambassadors in Pekin. After some severe fighting the allies entered that city on the 12th Oct., and the Chinese emperor submitted to the terms dictated by the conquerors. Another distant expedition undertaken by France was less fortunate in its ultimate results. For some years Mexico had been the theatre of civil war carried on by the so-called clerical party headed latterly by President Miramon, and by the liberal party headed by the rival President Juarez. A temporary suspension of the payment of indemnities due to France and England led to the intervention of the European powers. It was soon evident that France had ulterior objects in view; the extravagant demands of M. de Soligny and the presence of Miramon in the French camp rendered negociation impossible, and England and Spain formally withdrew from further intervention. In 1862 war was declared by France against Juarez, who was driven across the frontier. The government of the country was handed over to Maximilian, archduke of Austria, who assumed the title of Emperor. Supported as this prince was by French troops he could not preserve tranquillity in his dominions, and Napoleon began to recognize the grave position in which he had placed himself. The United States, moreover, who had always favoured Juarez, brought strong diplomatic pressure to bear on the French emperor, and in the autumn of 1866 he began to withdraw his troops from Mexico. On the conclusion of the Austro-Prussian war in 1866 Napoleon, alarmed at the growing power of Prussia, demanded a reconstruction of frontier, claiming by way of compensation for his neutrality on that occasion Prussian territory on the Saar. This was peremptorily refused

by Prussia. The ill-feeling between that nation and France was further increased in 1867, when the King of Holland signified his intention to cede Luxemburg to France. The cession was strongly resisted by Prussia, and at a conference held in London (7th–11th May) the neutralization of the duchy was agreed to by treaty under the guarantee of the great powers. It was now, however, evident that a rupture between France and Prussia was imminent, and in 1870, on the Spanish crown being offered to Prince Leopold of Hohenzollern, France demanded that the King of Prussia should compel him to refuse it. Notwithstanding the subsequent renunciation of the crown by the German prince, war was declared by France (19th July). (See FRANCO-GERMAN WAR.) One French army was driven back and cooped up in Metz, another was pushed northwards to Sedan, and so hemmed in that it had to surrender with the emperor at its head (2d Sept.) This disaster was fatal to the second empire. On the news becoming known in Paris the French chambers met, and at midnight, on the 3d Sept., the republic was proclaimed and the government of national defence formed. On the following day the Empress Eugénie, who had been appointed regent during the absence of Napoleon, fled from Paris. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th Jan. 1871). On the 26th February the preliminaries of peace were signed, by which France renounced the fifth part of Lorraine, including Metz and Thionville, and Alsace, less Belfort, and agreed to pay a war indemnity of five milliards of francs (£200,000,000). A definite treaty of peace was signed at Frankfort on the 10th May, and on the 18th was ratified by the French assembly. In the interval civil war had broken out in Paris, which was suppressed with great difficulty and at the expense of many lives and the destruction of some of the finest public buildings of the capital. (See COMMUNE OF PARIS.) The assembly, whose authority ought to have expired with the ratification of the peace they were expressly called together to pronounce, should have now dissolved, but this was impossible during the war of the Commune, and it was impracticable to appeal to the confused voice of the country when the pressing need was to restore tranquillity and give the nation time to think over the situation. Therefore the *pacte de Bordeaux*, the tacit understanding on which the assembly had been authorized to act, was ignored, and the deputies, who had elected Thiers, a former minister of Louis Philippe, president of the republic, continued to sit at Versailles. The Thiers administration, which lasted until the 24th May, 1873, set vigorously about wiping off the war debt, and thus freeing French soil from the invaders, which was eventually accomplished in the first half of the following September. Although throughout the whole period the nation had been singularly tranquil and prosperous, and was fast attaining her former place among the great powers, the monarchical faction in the assembly, professing to be alarmed at the spread of radicalism and socialism, offered on various occasions violent opposition to the government. At last, on the 24th May, an order of the day was presented to the assembly, stating that the existing cabinet failed to offer sufficient guarantees for conservative interests, and was carried. The resignation of Thiers naturally followed, and a successor was found in Marshal MacMahon. Under his and the preceding régime intrigues of more or less importance were carried on in the interest of one or other of the competitors for the crown, the most nearly successful being that of the adherents of the Comte de Chambord, or, as he is called by the legitimatists, Henry V. This prince, however, destroyed all his chances of success by an extravagant declaration, in which he claimed all the prerogatives enjoyed by his ancestors, the Bourbons, and manifested a narrow and retrogressive spirit totally out of sympathy with that of the nation and the age. The consequence of this failure was the prolongation of MacMahon's powers as president for seven years by a vote in the assembly, 19th Nov. 1873. On the 10th December Marshal Bazaine was convicted of having surrendered his army and the fortress of Metz without doing all in his power to avert such a catastrophe, and was condemned to be degraded and executed. The latter part of the sentence was commuted to twenty years' seclusion. France is at present in the anomalous position of being governed by a military dictator, backed by a bare majority of monarchical conservatives in the assembly, while the great mass of the people are evidently strongly republican and in close sympathy with the radical minority in the assembly.

The following table, showing the dates at which the great fiefs and various foreign territories were united to the crown, will serve to give an idea of the gradual growth of the French Kingdom. In referring to this table it must be remembered that many of the fiefs were not united directly to the crown, but in the first instance to some other fief, and that these are therefore in most cases not mentioned; and also that many of the fiefs, after being united to the crown, were afterwards detached, often more than once, as appanages, that is, as estates given to members of the royal family to support their dignity, in which cases only the final annexation is given. All those territories which were annexed at periods subsequent to feudal times, and which at the date of annexation belonged to foreign powers, are considered as foreign, even although they may at one time have been French fiefs. In the case of districts which had to be conquered after being officially united to the crown, the date of conquest is given. No account is taken of the occupation of a large part of France by the English in the reigns of Henry V. and Henry VI.:—

Table giving the Dates of the Union of the Great Fiefs and various Foreign Possessions to the French Crown.

Kings.	Date.	Territories.	Designation.
Hugh Capet,	987	County of Paris,	Fief.
Louis IX.,	1229	County of Carcassonne,	,,
	1229	County of Béziers,	,,
	1229	County of Nimes,	,,
Philip III.,	1272	County of Toulouse,	,,
Philip IV.,	1303	County of Lyon,	,,
Philip VI.,	1328	Barony of Champagne,	,,
	1328	County of Brie,	,,
	1349	Dauphiné de Viennois,	,,
Charles V.,	1377	Guienne,	,,
Charles VII.,	1422	Poitou,	,,
Louis XI.,	1465	Berry,	,,
	1468	Normandy,	,,
	1477	Boulonnais,	,,
	1477	Burgundy,	,,
	1477	Pardiac,	,,
	1480	Anjou,	,,
	1481	Maine,	,,
	1481	Provence,	,,
Louis XII.,	1498	Orléannais,	,,
	1498	Valois,	,,
Francis I.,	1515	Angoulême,	,,
	1525	Alençon,	,,
	1525	Le Perche,	,,
	1531	Dauphiné d'Auvergne,	,,
	1531	Duché d'Auvergne,	,,
	1531	Bourbonnais,	,,
	1531	Forez,	,,
	1531	Beaujolais,	,,
	1531	La Marche,	,,
	1532	Brittany,	,,

Kings.	Date.	Territories.	Designation.
Henry II.,	1558	Calais and district,	Foreign possession.
	1559	Bishoprics of Metz, Toul, and Verdun,	,,
Henry III.,	1583	Évreux,	Fief.
Henry IV.,	1589	Béarn,	,,
	1589	Armagnac,	,,
	1589	Foix,	,,
	1589	Albret,	,,
	1589	Bigorre,	,,
	1589	Vendôme,	,,
	1589	Périgord,	,,
	1589	Limoges,	,,
	1589	Kingdom of Navarre,	Independent kingdom.
	1601	Bresse,	Fief.
Louis XIII.,	1615	County of Auvergne,	,,
	1642	Principality of Sédan,	Foreign possession.
Louis XIV.,	1659	Artois,	,,
	1659	French Flanders,	,,
	1678	County of Burgundy (Franche Comté),	,,
	1697	Strasburg and district,	,,
	1713	Principality of Orange,	,,
Louis XV.,	1766	Lorraine and Bar,	,,
	1769	Corsica,	,,
Louis XVI.,	1789	Valentinois,	Fief.
Emperor Napoleon III.,	1860	Savoy,	Foreign possession.
	1860	Nice,	,,

French Language.—At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were the Celto-Teutonic of the Belgæ, the Celto-Iberic of the Aquitani, and the Celtic proper used in the centre of the country. The Roman language overwhelmed all these idioms. It would appear that in the fourth or fifth century, the whole of Gaul, from the Rhine to the Pyrenees, with the exception of Brittany, had adopted the language of the conqueror—not the *sermo urbanus* of the classic writers, but that form of Latin which, of course with dialectical variations, had become common to all the subjugated provinces of Central Europe—the *lingua Romana rustica*. On the overthrow of the Western Empire this language was modified by the mixture of words and expressions originally Frankish, Burgundian, Ostrogothic or Visigothic. This Theotiscan or Tudescan element was naturally more prominent north of the Loire. Probably the most ancient monument of this dialect is the oath of Louis the German to Charles the Bald, who, in his part, swore in German, in Strasburg, February, 842. For comparison's sake we subjoin the translation in modern French:—

Pro Deo amur et pro christian poblo et notro commun salvament, d'ist di in avant in quant Deus savir et potir me dunat, si salvarai io cist meon fradre Karlo, et in adjudha et in cadhuna cosa, si cum om, per dreit, son fradre salvar dist in o quid il mi altresi fazet; et ab Ludher nul plaid nunquam prendrai qui, meon vol, cist meon fradre Karle in damno sit.

Pour l'amour de Dieu et pour le peuple chrétien et notre commun salut de ce jour en avant (dorénavant), en tant que Dieu me donnera de savoir et de pouvoir, je soutiendrai mon frère Charles qui voilà, et par aide et en toute chose ainsi qu'on doit, par devoir, preserver son frère, pourvu qu'il en fasse le même pour moi, et ne prendrai jamais avec Lothaire aucun accommodement qui, par ma volonté, soit au préjudice de mon frère Charles ici présent.

This mixed idiom, known under the name Franco-Romana, early branched off into two characteristically different forms: the *Langue d'oc*, or the *Provençal* of the south; and the *Langue d'oïl*, or *Roman Wallon* of the north. These languages owe their names to their respective terms for expressing *yes* (French, *oui*). The Langue d'oc, more sonorous, more harmonious, and more poetic than the sister tongue, rapidly developed itself. It became the court language of the kings of Arles, who ruled over provinces more Romanized and less harassed by barbarian invasions than the territory of the dukes of Normandy, where the Langue d'oïl had its home. This was the age of the *Troubadours* of the south, who sang of love in melodious strains, and dwelt on the charms of a southern clime and a fruitful soil; of the *Trouvères* of the north, who invented a chivalrous mythology of their own, and ascribed to the heroes of Greece and Rome, and the courtiers of King Arthur and Charlemagne, the sentiments of their own times. The complete development of poetry in Provence was checked by the persecution of the Albigenses, the language of the Troubadours was proscribed, and along with the political rule of the north, a sub-dialect of Picardy, spoken in the Ile de France, extended towards the south. The real French language began to be developed about the beginning of the thirteenth century. Its sway was increased in that century by the extension of the crown lands; in the fourteenth by the growing authority of the house of Capet, the organization of the royal courts of justice and the parliament of Paris; in the fifteenth by the establishment of a military and fiscal system, but above all, by the invention of printing; and in the sixteenth the formal ordonnances of François I. forbade the use of any other language than French in the courts, and in public and private documents. The Académie Française established by Richelieu in 1635 for the regulation of the national language, the influence of the court, the labours of the Port Royalists and the writers of the memorable era of Louis XIV. purified, augmented, and diffused it more and more. It was first used as a diplomatic language at the conferences of Nimeguen, in 1678. Owing to its admirable clearness and precision, and its wealth of happy colloquial phrases, together with the fame of its great writers, and the important part France has continued to play on the stage of Europe, this language has now generally become the first a man of the world learns to speak after he has mastered his mother tongue.

Literature.—The earliest monuments of French literature are the productions of the Troubadours, who flourished during the eleventh and twelfth centuries. Their poems consist for the most part of short lyrical effusions of an amatory cast. Thibaut, the king of Navarre, sang in the service of his lady-love as a Troubadour. But we cannot help looking at the poetry of this epoch as a display of ingenuity and wit, rather than as the expression of passion and deep feeling. On the other hand, the Trouvères, who flourished at a somewhat later period, treated in their narrative poems (the *chansons de geste*) of national subjects, and celebrated the deeds of renowned kings and knights. These romances or chansons de geste are numerous, and have been divided into three cycles. The first narrated the deeds of the great Frankish emperor Charlemagne, his descendants and vassals; one of the oldest and best of this category of romances being the Chanson de Roland. The Armorican or Arthurian cycle consists of the poetical forms of the legends connected with ancient Britain and the achievements of the Norman warriors; the Roman de Brut, or that of king Arthur; and the Roman de Rou, or that of the dukes of Normandy, are the double foundation on which all the poems of this series rest. The third or Alexandrine cycle consists of poems in which the recollections of Greece and Rome are strangely enough mixed up with chivalric notions and legends of fairyland. La Guerre de Troie, by Benoît de St. More; the Alexandre by Lambert li Cors and Alexandre of Paris; the Médée, and the Ulysse by Raymond du Bosquet, are

fair examples of this class. Almost contemporaneous with the chansons de geste, and related to them as comedy or farce is to tragedy, sprung up the fabliaux, short, humorous, satirical, poetic tales, a species of literature which obtained its highest perfection and greatest popularity in France. One of the most celebrated of fabliaux writers is Rutebeuf, a contemporary of St. Louis. But by far the most notable production of this nature is the Roman de Renard, the composition of different hands and even of different ages. This satiric epopee throws an air of ridicule over all classes and institutions of the time, king and priest, knight and judge, court and cloister, tourney and pilgrimage. The spirit of the poem is the negation of that of chivalry, the vital principle of the middle ages. The progress of prose was slower than that of poetry. The earliest specimens are furnished by the monkish chroniclers, the most noteworthy being the Chroniques de France selon qu'elles sont conservées à St. Dénis. It was, however, the genius of a layman that made history the rival of poetry, and the Histoire de la Conquête de Constantinople (1302), by Villehardouin, an eyewitness, may be regarded as the first example of genuine French historical literature. This was followed by the Mémoires, in which Joinville (1223–1317) tells with winning naïveté the heroic deeds and private virtues of the good king Louis IX.; by the Chroniques de Froissart (1337–1410), which present the most animated pictures of society and manners of that period of war and gallant enterprise. By the Mémoires of Philippe de Commines (1445–1509) we are introduced to Louis XI. and his contemporaries, and we have striking evidence that the chivalrous poetic spirit of the middle ages had now fairly given way to shameless trickery and deep cunning. The race of the Trouvères may be said to have ended with Charles, duke of Orleans (1391–1465), whose graceful gallantry finds a strong contrast in the easy, unblushing impudence of Villon (1431–1500). The revival of classic learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Its principal characteristics being freedom of thought and variety of style, writers cannot be judged by a single standard. In originality Rabelais (1483–1553) and Montaigne (1533–92) hold the first rank. The former was a profound scholar, physician, and philosopher, yet contented himself with the renown of a profane humourist. His Vie de Gargantua et de Pantagruel is filled with strange tales, wild notions, and gross buffooneries, good sense, sound philosophy, and keen reasoning. As learned, as witty, and as sceptical as Rabelais, but wanting his coarseness, Montaigne lived a quiet, easy life, while France was being torn by civil war; writing his charming Essais, ridiculing the bigotry of the Catholic and the Protestant, the enthusiasm of the soldier, the trickery and pedantry of the judge; inclined to laugh at human imperfections rather as weaknesses than to storm at them as vices. These essays are a series of free and familiar disquisitions on every subject, and are one of the standards of French literature. Meanwhile the Reformation had been vindicated by Calvin (1509–64) in his Institution de la Religion chrétienne, a masterly production, which afforded convincing evidence that French prose had now acquired strength and gravity to become a fit vehicle of religious eloquence. Later in the century the admirable pamphlet the Satire Ménippée, and the speeches of Chancellor L'Hôpital, proved it to be flexible enough for political purposes. Amyot (1513–93) had invested it with new graces by happily blending French and Grecian beauties in his translation of Plutarch's Lives; its capacity for lighter themes had been previously demonstrated by the Heptaméron of Queen Margaret of Navarre (1492–1549). In poetry this period was less successful. Clement Marot (1495–1544) had indeed exhibited grace, elegance, and wit in his epistles, epigrams, and elegies; Ronsard (1524–85) attempted to invest French verse with that dignity and variety which he admired in the Greek metres, but his violent introduction of foreign forms and elements into the vernacular obtained scant success. The Cléopatre of Jodelle (1532–73) may be considered as the first drama of importance placed on the French stage. In the beginning of the next century the simplicity and ease of the verse of Regnier (1573–1613), and the correct and pure but somewhat cold and formal style of Malherbe (1556–1628), paved the way for the masters of the succeeding generation. Balzac (1584–1684) devoted his attention to the improvement of prose, his epistles especially being valuable at the time as models of harmonious rhetoric. Such were also the letters of his friend Voiture (1598–1648), affected and frivolous as they often are. Both were great favourites at the Hôtel de Rambouillet, the head-quarters of French euphuism and of the Précieuses. Out of another of these social reunions, which were more of the nature of literary clubs, Richelieu founded the French Academy (1635); but it was outside all such coteries that France was to find the great poet who was to usher in the glories of her Augustan age. Pierre Corneille (1606-84), with his Cid, Cinna, Horace, and Polyeucte, brought French tragedy to a degree of grandeur which it has not surpassed. Pascal (1628–62) blends all the caustic irony of a satirist with the wrapt inspiration of a saint in his Lettres à un Provincial, the latter element alone being present in his fragmentary Pensées. Descartes (1596–1650) showed in his Discours sur la Méthode that the language was now equal to the highest philosophical subjects. Among the historical works of this period may be mentioned the Mémoires of Brantôme (1527–1614) and of the Cardinal de Retz (1604–79), and the Économies Royales of Sully (1560–1641). We have now reached the golden age of French literature, the Siècle de Louis XIV. Foremost among the poets stand Boileau Despréaux (1636–1711), the author of the nine famous satires, of the Art Poétique, and of the Lutrin; La Fontaine (1621–95), the prince of fabulists, from whom we have a series of rather indelicate Contes, and the most charming collection of Fables. The drama was represented by Racine (1639–99), whose tragedies are the crowning glory of the French stage; and by Molière (1639–93), the best comic dramatist the world has ever seen. Under the absolute sway of the Grand Monarque philosophy became orthodox under the guidance of Malebranche (1631–1715), Bossuet (1627–1704), and Fénelon (1656–1715). By the two last-mentioned writers, and by Bourdaloue (1632–1704), Massillon (1663–1742), and the Protestant divines Claude (1618–97) and Saurin (1677–1730), sacred eloquence was carried to a high state of perfection. The more important didactic prose writings of the age are the cynical Maximes of La Rochefoucauld (1613–80), the Caractères of La Bruyère (1639–99), and the Lettres and Discours of St. Evremond (1613–1703). In the inimitable letters of Madame de Sévigné (1627–96) to her daughter and friends we have a lively and complete picture of the age, the writers of which had generally conformed to the manners, taste, and religion professed by the court. Before we fairly reach the philosophic era we meet with the names of Le Sage (1668–1747), to whom we are indebted for the *chefs d'œuvre* in novel-writing Gil Blas and the Diable Boiteux; St. Simon (1675–1755), the writer of the Mémoires which treat

and complete in historical language what Sévigné began in her easy, gossiping style; Vauvenargues (1715–47), the author of Maximes much healthier in tone than those of La Rochefoucauld; the poet Louis Racine (1692–1763), son of the great dramatist, author of a poem now little read, La Religion; and the versatile and superficial Fontenelle (1657–1757), dramatist, metaphysician, historian, and man of science. The seventeenth century may be said to be fully represented by one man, François Marie Arouet de Voltaire (1694–1778). He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher. It cannot be said that he excelled in the highest walks of literature; France could no more boast of a great epic poem after the Henriade was written than she could before it; his tragedies are cold and formal, abounding in philosophical disquisitions; his histories are brilliant, but inaccurate. But his fund of common sense, his keen wit, his persistency, and his appreciation of the tendency of the age, made him be looked upon as chief of the republic of letters for more than half a century. The corrupt practices of priests and rulers drove him into conflict with ecclesiasticism and monarchy; yet, compared with some of his disciples, he might be considered a Christian and conservative. His more important works are: Zaïre, Mérope, Alzire, and Tancrède (tragedy); Henriade (epic); Dictionnaire Philosophique; Charles XII., Siècle de Louis XIV. (histories); Candide (novel), &c. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712–78), whose fiery eloquence has never been surpassed. His Discours contre les Sciences et les Arts was a declaration of war against civilization; his Origine de l'Inégalité parmi les Hommes, a violent attack on the existing social order; and his Contrat social proclaimed the principles of popular sovereignty and universal suffrage. In his Emile he draws a visionary plan of education; his Nouvelle Heloïse is a novel in which love and paradox are strangely blended together; while his Confessions excite a mingled feeling of sympathy and disgust. These two great men had each their school of disciples, who were the foremost actors in the revolution. Buffon (1707–88) occupied a less agitated sphere, devoting his powerful intellect to the study of nature; his great Histoire Naturelle is a monument which time can scarcely injure. Montesquieu (1689–1755), a writer of unusual scope of mind, combining a masculine vigour with great brilliancy of style, commenced his career with his Lettres Persanes, a satire on French manners, government, and even religion. Then followed his Considérations sur la Grandeur et la Décadence des Romains, a master-piece of historical style; and finally the Esprit des Lois, a profound disquisition upon general legislation. Diderot (1713–83), a passionate and incorrect writer, and D'Alembert (1717–83), a great geometrician, founded the Encyclopédie, a vast review of human knowledge, often hostile to social order and always to religion. Among the extreme innovators of the time the most notable are Helvetius, D'Holbach, La Mettrie, and Raynal; Condillac, Condorcet, and Mably kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1737–1814), author of Paul et Virginie, and Prévost (1697–1763), author of Manon Lescaut, are particularly worthy of mention; while dramatic literature was enriched by the Barbier de Séville and the Mariage de Figaro of Beaumarchais (1732–99), and the tragedies of Ducis and Crébillon. The age was not poetical; poetry had degenerated into imitations of foreign descriptive poets, such as Thomson. The most successful writer of this stamp was Delille (1738–1813). André Chénier (1762–94), the most promising of all, fell beneath the guillotine just after completing his Jeune Captive. Neither the revolution nor the first empire was favourable to literature. Some tragedies by Joseph Chénier (1784–1811), founded on the classic models, a few light comedies and novels of little note, are the only representatives of literary activity, until we come upon the names of Châteaubriand (1768–1848) and Madame de Stael (1766–1817). The former, in his Génie du Christianisme and his Martyrs, and the latter in her Allemagne, Delphine and Corinne, combated the sceptical spirit of the age of Voltaire; and its political creed was attacked, not very successfully, however, by Joseph de Maistre (1754–1821) and De Bonald (1753–1840). A more moderate politician and more philosophical writer on sociology and religion is found in Benjamin Constant (1767–1830). Later on in the present century the influence of Goethe, Schiller, Shakspeare, Scott, and Byron began to be felt. The Greek dramatists were no longer considered the only nor even the best models; the arbitrary classical rules, the strict observance of the three unities, which cramped the genius of Corneille and Racine, and which latterly reduced the French drama to a state of insipid conventionalism, were boldly set aside. The middle ages and the present time demanded the warmest sympathy and the most earnest study. Such was part of the creed of many of the most gifted of the younger men of letters in France, and a new school, called the *romantic*, sprung up, headed by Victor Hugo (1802...), who promulgated the new theories in the preface to his drama of Cromwell, and carried them into practice in numerous poems (Odes et Ballades, Orientales, Feuilles d'Automne, Chants du Crépuscle, &c.), dramas (Cromwell, Marion Delorme, Ruy Blas, Lucrèce Borgia, Le Roi s'amuse, &c.), and novels (Notre Dame de Paris, Les Misérables, Les Travailleurs de la Mer, &c.) The most notable of his associates were Alfred de Vigny (1779–1863), calm, elegant, and somewhat too refined, author of a volume of Poëmes antiques et modernes, of a translation of Othello, and of a novel, Cinq Mars, by which he is best known to English readers; the capricious Alfred de Musset (1810–1857), at once the Ariel and Caliban of modern French literature, equally at home in the domains of poetry, drama, and romance, and whose favourite hero is a French copy of Byron's Corsair, Lara, or Don Juan; Saint-Beuve (1804–1869), who published several volumes of poetry (Consolations, Pensées d'Août, &c.), but now chiefly famous for his Causeries du Lundi and other works of a literary-historical nature, in which he has proved himself to the satisfaction of numerous authorities the best literary critic France has ever possessed; and Alexandre Dumas the elder, who opened his career with a historical drama, Henry III., which was quickly followed by Charles VII., Antony, Teresa, &c., but who is best known on this side of the Channel by his novels, Monte Cristo, Les Trois Mousquétaires, Vingt Ans Après, &c. A reactionary movement was attempted, led by Ponsard (1814–67) and Emile Augier (1820...). Casimir Delavigne (1793–1843) has attempted to combine the classic and romantic schools; and Lamartine (1790–1869) is more than half a romanticist by sentiment and style. Béranger (1780–1857), the greatest of French song-writers, may be considered as belonging to neither of the two schools, though he was ranged on the classicist side. The twenty-five volumes of light, sparkling comedies and vaudevilles, by the indefatigable librettist Eugène Scribe, can scarcely be claimed by any of the rival parties. After the heat of the struggle was over, which was chiefly carried on in the region of the drama, the novels of Georges Sand (Madame Dudevant, 1798...) began to attract

attention. Her Indiana, Lélia, Jacques, André, Consuelo, La petite Fadette, La Mare au Diable, &c., have gained her the reputation of possessing the finest style of any writer of the age. Balzac (1799–1850), by several critics considered the greatest of French novelists, lays bare all the vices of modern society in his Eugénie Grandet, Le Père Goriot, Scènes de la Vie Privée, &c. Low life in Paris was vividly depicted by Eugène Sue (1804–57) in the Mystères de Paris, Martin l'Enfant trouvé, &c. The charming and pure tales of Picciola, by Saintine, and Colomba, by Prosper Mérimée, are especially worthy of notice. Equally healthy in tone are the novels of Frédéric Soulié and Émile Souvestre, and the exquisite stories of the two novelists, conjoined in work as in name,—Erckmann-Chatrian. Of late years a new school, styled the materialist, has arisen, represented by the younger Dumas, Victorien Sardou, Octave Feuillet, Ernest Feydeau, Henri Murger, and Edmond About. Their dramas hold almost sole possession of the French stage, and their novels (often the material from which the author himself constructs a play) have also secured the lion's share of popular favour. Some of the most delicate of social problems are treated in them with candour, if with little delicacy and if not to much profit. In fact it must be confessed that the princesses of the demi-monde, grisettes, or cocottes are not healthy company, even when put by their champions, Dumas fils and his school, upon their very best behaviour. If the preceding century was the philosophic age *par excellence*, the present may be said to be the historical. The following are the chief writers and their principal works. Louis Blanc (1813...), Histoire de Dix Ans, Histoire de la Révolution Française; Guizot (1787...), Mémoires relatifs à l'Histoire de France, Histoire de la Révolution d'Angleterre; Michaud (1767–1839), Histoire des Croisades; Michelet (1798...), Histoire de France, Histoire de la Révolution Française; Mignet (1796...), Histoire de la Révolution Française; Sismondi (1773–1842), Histoire des Français, Républiques Italiennes du Moyen Age; Amédée Thierry (1787...), Histoire des Gaulois; Augustin Thierry (1795–1856), Conquête de l'Angleterre par les Normands, Le Tiers État; Thiers (1797...), Histoire de la Révolution Française, Histoire du Consulat et de l'Empire. Literary historians: J. J. Ampère (1800–64), Histoire littéraire de France avant le XII Siècle, Littérature Française au Moyen Age; Littré (1801...), Histoire de la Langue Française, Comte et la Philosophie positive; St. Marc-Girardin (1801...), Cours de Littérature Dramatique, La Fontaine et les Fabulistes; Sainte Beuve (1804–69), Port-Royal, Causeries du Lundi, Nouveaux Lundis, Portraits Contemporains; Taine (1828), Histoire de la Littérature Anglaise, Les Philosophes Français du XIX Siècle; Vinet (1797–1847), Blaise Pascal, Moralistes des XVI et XVII Siècles. Philosophy is represented in this age by Auguste Comte (1798–1857), Cours de Philosophie positive; Victor Cousin (1792–1867), Le Vrai, le Beau, et le Bien, Histoire de la Philosophie; Cuvier (1769–1832), Histoire des Sciences Naturelles; Jouffroy (1796–1842), Cours de Droit Naturel, Cours d'Esthétique; Lamennais (1782–1854), Esquisse d'une Philosophie; Montalembert (1810–70), Du Vandalisme et du Catholicisme dans l'Art; Quinet (1803...), Le Génie des Religions, Le Christianisme et la Révolution; Rémusat (1797...), Essais de Philosophie, Abélard, St. Anselme, Philosophie Religieuse; Renan (1823...), Histoire des Langues Sémitiques, Vie de Jésus, Les Apôtres, St. Paul. Among the chief writers on political economy and sociology are Bastiat (1801–50), Sophismes et Harmonies Économiques; Chevalier (1806...), Religion St. Simonienne, Cours d'Économie Politique; Prévost Paradol (1829–70), Revue de l'Histoire Universelle, Du Rôle de la Famille dans l'Éducation; Tocqueville (1805–59), Démocratie en Amérique, Le Droit au Travail; Jules Simon (1814...), La Religion Naturelle, La Liberté, Le Travail. We can simply mention the names of the principal scientific writers:—Étienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, Duméril, in natural science; Gay-Lussac, Bichat, Corvisart, Magendie, in chemistry and medicine; and Lagrange, Laplace, and Arago in mathematics. Writers of travels, &c., are: Burnouf, Caillé, Champollion, Dumont-D'Urville, Father Huc, and others. The essayists and literary and art critics are legion: Alphonse Karr, Émile Girardin, Jules Janin, Fétis, Villemessant, Théophile Gautier, Philarète Chasles and Léon Gozlan, are among the best known.

French Architecture.—The earliest specimens of architecture in France belong to the Gallo-Romanic period. The Maison carrée, a Corinthian temple in Nîmes, is one of the best preserved and most interesting structures of that age. It is evident from what is still preserved of the ecclesiastic and other buildings that the forms of Greek art adopted by the Romans were closely imitated; and even up till the eleventh century the construction of all edifices of importance was intrusted to Italian architects trained in the classic schools. Then the Gothic style arose, and carried all before it. The architectural art was cultivated by the ecclesiastics, and many buildings of extraordinary merit owe their origin to some monks, so piously humble that they have left no trace of their names. Some names have, however, come down to us. Fulbert, of Chartres, planned the cathedral of that town, and directed for a time the construction (1020); the abbey church of St. Dénis was built from the plans of the minister Suger. The cathedral of Amiens was commenced in 1220 by Robert de Luzarche, and continued by Thomas and Renaud de Cormont. About the middle of the thirteenth century there were three architects of great fame in France,—Jean de Chelles, who built the lateral portico in the south side of the cathedral of Notre-Dame, at Paris; Pierre de Montereau, who planned the old Holy Chapel of Vincennes; and Eudes de Montreuil, to whom Paris was indebted for several imposing churches now destroyed. Covey and Le Bergier rebuilt the ancient cathedral at Reims, which had been destroyed by a fire. Jean Ravy, sculptor and architect, employed his double talent to complete the cathedral of Notre-Dame (1351). The Gothic style began to lose ground about the end of the fifteenth century; and under the influence of the southern artists introduced into France by Francis I. Italian architecture obtained firm footing. The most celebrated French architects of that period were Lescot, who designed the Fountain Des Innocents; Delorme, who constructed some of the finest portions of the Louvre; and Jean Bullant. Under the regency of Marie de Medicis flourished Desbrosses, who planned the Luxembourg Palace. The age of Louis XIV. was favourable to this art, and we meet with the notable names—Perrault, who erected the colonnade of the Louvre; of Bruant and Mansard, who built the Hôtel des Invalides. The Palace of Versailles is the work of Mansard alone. The principal architects of the eighteenth century are—Gabriel, who designed the square now known as the Place de la Concorde; Oppenor, who designed the greater part of the Palais Royal; G. de Boffrand, De Wailly, Lemaire, D'Ivry, Soufflot, the architect of the Panthéon and the Ecole de Droit; Antoine, Moreau, Descoutures, and Desmaisons, the joint authors of the Palais de Justice; Rousseau,

who planned the Palace of the Legion of Honour, now burned down; Louis, who built the Théâtre Français; Chalgrin, whose chief work is the Collége de France, &c. Under the first empire the Bourse was erected by Brongniart, the Madeleine by Vignon and Huvet, the Arc de Triomphe du Carrousel and one of the wings of the Louvre by Fontaine and Percier, the Corps Législatif by Poyet.. The contemporary architects of most note are Garnier, who erected the new Opera House; Visconti, who completed the Louvre; Baltard, who planned the Halles; Lefuel, who reconstructed the Tuileries; Espérandieu, Viollet-le-Duc, Gau, Blouet, Duc, the architect of the façade of Palais de Justice, &c.

French School of Painting.—France, in the reign of Charlemagne, and subsequently, had numerous miniature and enamel painters, but can be hardly said to have had a school of painting of its own until the sixteenth century. With the exception of the Clouets (father, son, and grandson) and Jean Cousin, who owed little to foreign masters, the older French painters either studied in Italy or were mere imitators of Italian painters; while many Italians were either temporary or permanent residents in France. Among these were Leonardo da Vinci, Andrea del Sarto, Rosso, and Primaticcio, all of whom were invited by Francis I. The influence of Rosso and Primaticcio was considerable. Commissioned by the king to decorate the Palace of Fontainebleau, they employed many Italian and French artists as assistants, on whom they imposed their ideas, manner, and style, and this created a distinct school known as that of Fontainebleau. An independent French style was formed by Simon Vouet (1582–1641), who had studied Caravaggio and the later Venetian painters, and who was regarded as the master and model of the succeeding generation of French artists. Nicolas Poussin (1594–1665), a contemporary, stamped a character on the art of his country which may be said to have lasted almost to our own days. Claude Gelée (1600–82), better known as Claude Lorraine, from the place of his birth, is of all landscape-painters the one best able to express the poetry of nature. The most celebrated of Vouet's disciples were Eustache Lesueur (1617–55), deservedly named the French Raffaelle; and Charles Lebrun (1619–90), who, as court painter to Louis XIV., exercised a considerable influence on the taste of his time by his somewhat pompous and theatrical paintings. He was one of the founders of the Academy of Painting and Sculpture at Paris, and the French Academy at Rome. Pierre Mignard (1610–95), another pupil in the same school, was justly esteemed for the nobleness of his style and the delicate grace of his execution. The pomp and ceremony of the court of Louis XIV. were succeeded by the gaiety and licentiousness of that of the regent. The *fêtes galantes* of the nobility were represented with piquant grace by Antoine Watteau (1684–1721). His exquisite finish, the poetic charm with which he transferred to his canvas the follies of the regency, have gained for him a fame which suffers somewhat from the attack of the higher critics, who charge him and his imitators, Lancret, Pater, and Boucher, with having degraded French art to its lowest pitch. In opposition to this school arose another, inspired with purer and healthier ideals:—Pierre and Vien, historical painters; Chardin; and greater than all, J. B. Greuze (1725–1805), who represented the scenes of every-day life; and Varnet, painter of landscapes and sea pieces. It was, however, painfully evident that art was steadily deteriorating. It owes its resuscitation to the mental excitement of the revolution; but the form which it assumed was due to the genius and energy of Jacques Louis David (1748-1825). Possessed of the stern virtues of the ancient Roman, he tried to inculcate elevated sentiments on his disciples, to gain the sympathy of the French school for what was truly noble, grand, and heroic. Many of his works are genuine masterpieces, distinguished for the perfection of the drawing, the purity of the lines, and the firmness of the model. Among the most distinguished of his pupils are Gérard, Gros, Drouais, Granet, and Ingres. A reaction against this classic school, as it was called, was headed by Géricault, Delacroix, Delaroche, Scheffer, and Descamps. Among the other eminent French contemporary artists we may mention Rosa Bonheur, renowned as an animal painter; Courbet, the leader of a new school called the realistic; Gustave Doré, Cabanel, Yvon, Bin, historical painters; Gérôme, Comte, Hector Leroux, G. Boulanger, Lévey, Bréton Millet, Hébert, as genre painters; Corot, D'Aubigny, André, Noël, and Barry, as landscape and marine painters; and Chaplin, Henner, Mademoiselle Jacquemart, and Madame Henriette Browne, as portraitists.

French Sculpture.—The first essays of the French sculptors after the rude and inartistic productions of the Gallo-Roman period had ceased to satisfy artistic taste were little else than mere imitations of the Byzantine school, and later on of the Italian. It was not until Jean Goujon (1515–72) had produced his Diana that France could boast of a master peculiarly her own. His most remarkable work is the Fontaine des Innocents at Paris. Germain Pilon (1516–90), Jean Cousin (about 1500–90), and Barthélemy Prieur (died 1611) were the ablest of his contemporaries. Jean de Bologne (1524–1608), though a Frenchman by birth, may be looked upon as an Italian from his long residence in Italy and his training under Michael Angelo. Jacques Sarazin (1590–1660) was educated at Rome, and united genius with great taste and grace. François Anguier (1604–69) executed the beautiful tomb of the Duke of Montmorency in the church of St. Mary at Moulins, and along with his brother Michel the statues and reliefs of the Porte St. Denis. Girardon (1628–1715), pupil of the former, was the favourite sculptor of Louis XIV., and executed a great number of statues for Versailles, Trianon, and other residences of the king. A much superior artist, however, was Pierre Puget (1622–94), who, unassisted by any master, gained for himself deservedly the title of the French Michael Angelo. He is undoubtedly one of the greatest sculptors of modern times. The art was practised with more or less success down to the present century by Pierre Legros, the brothers Couston, Bouchardon, L. Adam Lemoyne, Bosio, Stouf, Slodz, and Pigalle. The classic or academic revolution which took place in painting under the influence and direction of Louis David extended itself to sculpture, but the new school which arose, in their zeal for reform, soon fell into conventionality and affectation. The downward progress of the art was, however, arrested by David (of Angers) (1789–1856), Pradier (1792–1852), and Rude (1784–1858). Among the more distinguished contemporary French sculptors may be mentioned Barye, Ramey, Jouffroy, Perraud, Carpeaux, Caïn, Guillaume, Gruyère, Leharivel-Durocher, Dubois, Falguier, Aizelin, Chapu, &c. According to the opinions of some of the most eminent French critics the contemporary sculpture seems to be greatly lacking in originality and individuality: there is prettiness but no beauty, mechanical dexterity but no genuine and profound artistic ability. The sculptors aim too much at immediate success, and find it often in imitating a style which may have hit the public taste.

For an account of the Roman Catholic Church in France see GALLICAN CHURCH.

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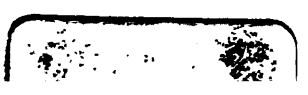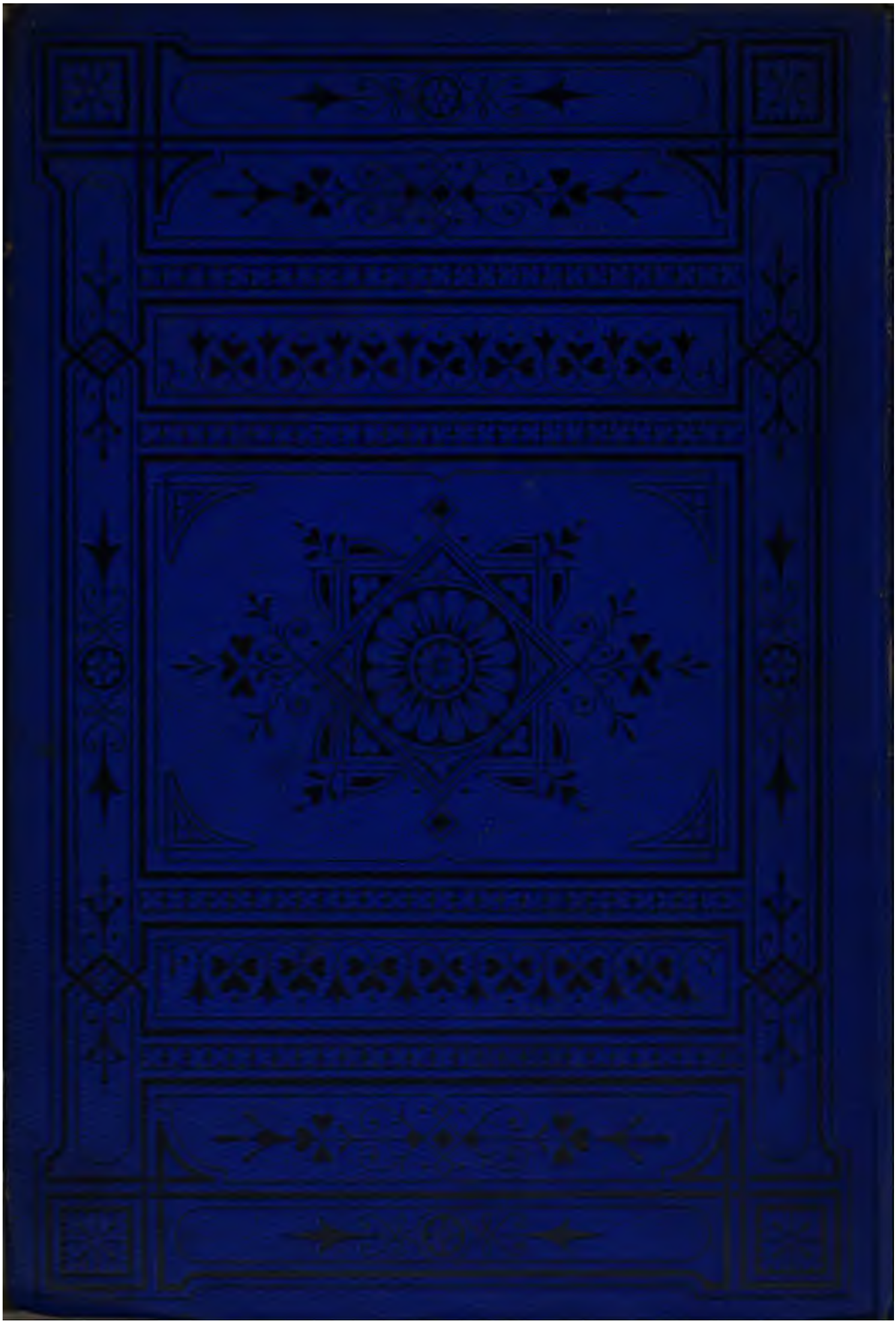
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